{In Archive} Meeting on Westlake at 1PM
Dan Gravatt to: Cheryle Micinski 04/27/2010 11:24 AM
Archive: This message is being viewed in an archive.

Cheryle,
Got your voicemail, and 1PM works for me for a brief meeting. See below for HQ's markups of the revised draft SFS workplan - most of these markups are wordsmithing that has no value-added (in my opinion) or have already been fixed by the PRPs. I am attaching my proposed approval-with-comments letter as well.

Sincerely,
Daniel R. Gravatt, PG
US EPA Region 7 SUPR / MOKS
901 North 5th Street, Kansas City, KS 66101
Phone (913) 551-7324 Fax (913) 551-7063

EPA approval of revised FS addendum WP.doc

----- Forwarded by Dan Gravatt/R7/USEPA/US on 04/27/2010 11:21 AM -----

From:	Rich Kapuscinski/DC/USEPA/US
To:	Dan Gravatt/R7/USEPA/US@EPA, Daniel Wall/SUPR/R7/USEPA/US@EPA
Cc:	Doug Ammon/DC/USEPA/US@EPA
Date:	04/19/2010 03:58 PM
Subject:	OSRTI Consultation Regarding Westlake Work Plan for Supplemental FS

Gentlemen-

On behalf of OSRTI, thanks for the opportunity to review the revised work plan for the Westlake SFS, dated March 28, and submit comments. Our review focused on the most significant regulatory and technical issues we identified previously regarding the January 28 draft, and the relevant portions of the work plan that were modified. We rely upon Region 7's review to verify that all comments submitted previously by EPA have been adequately addressed. We rely upon MDNR's review to identify any remaining issues regarding Missouri's requirements and design elements of the potential on-site disposal cell.

To facilitate preparation of a final work plan, we offer our comments and suggestions in the form of specific edits to the revised work plan, as shown in the attached MS-Word file. Our most significant suggestions are intended to clarify certain elements of the SFS, consistent with our previous comments. Although the attached file also identifies and corrects a few, relatively minor typographic errors, we did not conduct an exhaustive review of the draft work plan.

Please let me know if you have any questions or concerns about our reaction to the revised work plan.

Rich Kapuscinski

Work Plan for SFS West Lake LF OU-1 DRAFT RL SO 4-7-10_HQcomments.doc

Dan Gravatt Rich, here's the Word redline version as you req... 04/08/2010 03:56:07 PM

From:	Dan Gravatt/R7/USEPA/US
To:	Rich Kapuscinski/DC/USEPA/US@EPA, Daniel Wall/SUPR/R7/USEPA/US@EPA
Date:	04/08/2010 03:56 PM
Subject:	Fw: Redline version of revised SFS Work Plan

Rich, here's the Word redline version as you requested...

Daniel R. Gravatt, PG
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----- Forwarded by Dan Gravatt/R7/USEPA/US on 04/08/2010 02:55 PM -----

From:	"Paul Rosasco" <paulrosasco@emsidenver.com>
To:	Dan Gravatt/R7/USEPA/US@EPA
Date:	04/08/2010 02:18 PM
Subject:	Redline version of revised SFS Work Plan

Dan,

Per your request, attached please find a redline/strikeout version of the Work Plan for the Supplemental Feasibility Study for West Lake Landfill OU-1.

-Work Plan for SFS West Lake LF OU-1 DRAFT RL SO 4-7-10
[attachment "-Work Plan for SFS West Lake LF OU-1 DRAFT RL SO 4-7-10.doc" deleted by Rich Kapuscinski/DC/USEPA/US]

DRAFT – Revision 1

Work Plan for Supplemental Feasibility Study

Radiological-Impacted Material Excavation Alternatives Analysis West Lake Landfill Operable Unit-1

Prepared for

The United States Environmental Protection Agency Region VII

Prepared on behalf of

The West Lake Landfill OU-1 Respondents

Prepared by

Engineering Management Support, Inc.
7220 West Jefferson Avenue, Suite 406
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March 29, 2010

Table of Contents

Table of Contents (cont.)

Table

Table of Contents (cont.)

Figures

Appendices

List of Acronyms

ACM	asbestos containing materials
amsl	above mean sea level
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Recovery, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeter
cm/sec	centimeter per second
COPC	Contaminant of Potential Concern
CSR	Code of State Regulations
DCGL	Derived concentration guideline
DOT	United States Department of Transportation
EMSI	Engineering Management Support, Inc.
ENR CCI	Engineering News Record Construction Cost Index
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
FS	Feasibility Study
ft	feet
gm	gram
GM	Geiger Mueller
HHRA	Human Health Risk Assessment
HI	Hazard Index
IC	Institutional Control
kg	kilogram
L	liter
LEL	lower explosive limit
LLRW	Low level radioactive waste
m	meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	Multi-channel analyzer
MDA	Minimum detectable activity
MDNR	Missouri Department of Natural Resources
mg	milligram
mm	millimeter
MTG	Migration to Groundwater
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit

List of Acronyms (continued)

pCi	pico Curie
PID	Photoionization Detector
PPE	personal protective equipment
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SFS	Supplemental Feasibility Study
SLAPS	St. Louis Airport Site
SLDS	St. Louis Downtown Site
SOW	Statement of Work
SWMP	Solid Waste Management Program
TS	Transfer Station
TSDF	Treatment, storage, and disposal facility
ug	microgram
UMTRCA	Uranium Mill Tailings Radiation Control Act
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USCS	United States soil classification system
VOCs	Volatile Organic Compounds
VCA	Verification of current acceptability

1 Introduction

This Work Plan describes the work to be performed and the methods to be used to conduct a Supplemental Feasibility Study (SFS) of a select group of potential remedial alternatives for Operable Unit 1 (OU-1) at the West Lake Landfill Site. This Work Plan has been developed pursuant to EPA's January 11, 2010 letter to the OU-1 Respondents, the attached Statement of Work (EPA, 2010b) and in response to comments provided by EPA and MDNR on an initial draft version of this Work Plan (EPA, 2010c and 2010d and MDNR, 2010).

1.1 Site Background

The West Lake Landfill Superfund Site is located in Bridgeton Missouri approximately four miles to the west of Lambert-St. Louis International Airport and approximately 17.5 miles from downtown St. Louis (Figure 1). The West Lake Landfill Superfund Site is a former solid waste landfill facility that consists of various contiguous and discrete areas historically used for disposal of municipal solid wastes and construction and demolition debris.

EPA has divided the site into two Operable Units. Operable Unit 1 (OU-1) consists of two areas where radiologically impacted soil is present within the landfill mass in two portions of the waste disposal areas at the site. These two areas are referred to as Radiological Area 1 and Radiological Area 2 (Figure 2). OU-1 also includes adjacent property that has previously been referred to as the Ford property as it was previously owned by Ford Motor Credit but has since been divided into two parcels that includes Crossroads Lot 2A-2 which is part of the Crossroads development and the landfill Buffer Zone (Figure 2). OU-2 consists of other areas of historic solid waste disposal including a former construction and demolition landfill and an inactive solid waste landfill (Figure 2).

1.2 Prior Remedial Investigation/Feasibility Study

Remedial Investigation (RI) and Feasibility Studies (FS) were previously completed for both OU-1 (EMSI, 2000 and 2006) and OU-2 (Herst & Associates, 2000 and 2006). Based on the results of the OU-1 RI, six potential remedial alternatives were identified and evaluated in the FS for OU-1 portion of the landfill. The six remedial alternatives evaluated for OU-1 included the following:

1. No action;
2. Landfill cover repair, maintenance, additional access restrictions, additional institutional control restrictions, and monitoring;
3. Additional soil cover;

4. Regrading of Radiological Areas 1 and 2 (2% minimum slope) and installation of a RCRA Subtitle D landfill cover system;
5. Regrading of Radiological Areas 1 and 2 (5% minimum slope) and installation of a RCRA Subtitle D landfill cover system; and
6. Partial excavation and offsite disposal and regrading and installation of a RCRA Subtitle D landfill cover system..

Four remedial alternatives, including no action; institutional and access controls; capping and institutional and access controls; and excavation were identified and evaluated for the former Ford property (Buffer Zone/Crossroads properties).

Based on the results of the RI/FS, EPA developed a Proposed Plan (EPA, 2006) and held three public meetings and provided for an extended period for public comment on the Proposed Plan.

1.3 EPA-Selected Remedy

Based on the above documents and activities, EPA selected a containment remedy for OU-1 to protect human health and the environment by providing institutional and engineering controls for the landfilled waste materials. These controls prevent human receptors from contacting the waste material or underlying groundwater and control contaminant migration to air or groundwater.

The description and basis for the selected remedy was documented in the Record of Decision (ROD) [EPA, 2008]. The components of the selected remedy include the following:

1. Landfill Cap: Install landfill cover system to control and minimize the migration of contaminants from the OU-1 source areas and prevent direct contact with landfilled wastes.
2. Buffer Zone/Crossroads Property: Consolidate radiologically contaminated soil within Radiological areas 1 and 2 prior to installation of the cap.
3. Groundwater Monitoring: Implement long-term groundwater monitoring program to demonstrate groundwater protection.
4. Institutional Controls: Implement land use restrictions to ensure future uses do not impact the effectiveness or the integrity of the remedy.
5. Surveillance and Maintenance: Implement periodic inspection and maintenance program for all components of the remedy.

Performance standards for each of the selected remedy components are specified in the ROD. Additional performance standards were identified and will be incorporated into the remedial design as a result of subsequent discussions between Region 7 and the EPA Office of Superfund Remediation and Technology Innovation.

1.4 Scope of Supplemental FS

EPA has recently determined that additional work is necessary to accomplish the objectives of the RI/FS for OU-1. Specifically, EPA has requested the OU-1 Respondents to perform an SFS consisting of an engineering and cost analysis of two remedial alternatives that would remove from the radiologically-contaminated areas (Radiological Areas 1 and 2 and the Buffer Zone/Crossroads properties) in OU-1 all waste materials with significant levels of radioactivity; referred to herein as "full rad removal". The supplemental evaluation of these alternatives is intended to complement the evaluation of alternatives reported in the Feasibility Study, which includes consideration of a "partial rad removal" alternative. {Comment: Assuming there is acceptance of this modified term ("full" rad removal), please do a global search-and-replace throughout the document.}

EPA has indicated (EPA, 2010a) that "complete rad removal" is intended to remove radionuclides from Radiological Areas 1 and 2 to the degree feasible such that additional engineering and institutional controls would not be required due to the radiological content of these areas. As these areas may still contain solid wastes after removal of the radiologically-impacted materials, regrading, capping and establishment of institutional controls related to the presence of other solid wastes would still be required for these areas.

In its January 11, 2010 letter (EPA, 2010a) and the attached SOW (EPA, 2010b) EPA identified two "complete rad removal" alternatives that should be developed and evaluated:

1. Excavation of radioactive materials with off-site commercial disposal of the excavated materials; and

2. Excavation of radioactive materials with on-site disposal of the excavated materials in an on-site engineered disposal cell with a liner and cap, if a suitable location outside the floodplain can be identified.

Once developed, these alternatives will be evaluated using the threshold and primary balancing criteria provided in the National Oil and Hazardous Substances Pollution Contingency Plan at 40 CFR § 300.430 ("NCP") (EPA, 2009a). The SOW also required the "complete rad removal" alternatives be compared against the remedy selected in the Record of Decision for OU-1 using these same threshold and primary balancing criteria.

The engineering and cost analyses of the "complete rad removal" alternatives and the ROD-selected remedy will be performed based on existing information provided in the Remedial Investigation (EMSI, 2000), Baseline Risk Assessment (Auxier, 2000), Feasibility Study (EMSI, 2006), and the ROD for OU-1. These analyses will also consider the results of supplemental evaluations prepared by EPA subsequent to the ROD (TetraTech, 2009). Additional information may also be obtained from various vendors of equipment, materials and services as necessary to evaluate the potential effectiveness, implementability and cost of the "complete rad removal" alternatives. Additional field investigations or laboratory testing are not included in the scope of this effort and will not be performed.

The OU-1 Respondents have tasked Engineering Management Support, Inc. (EMSI) to conduct the supplemental feasibility study work. This Work Plan describes the engineering analyses and other evaluations necessary for preparation of a SFS Report for the "complete rad removal" alternatives. This Work Plan describes the engineering evaluations necessary to develop and evaluate the "complete rad removal" alternatives, the evaluations of the alternatives using the threshold and primary balancing criteria specified in the NCP, and the preparation of a SFS Report documenting the results of these evaluations. A project schedule for completion of the SFS and a description of the project personnel that will perform these analyses are also included in this Work Plan.

As with any FS or engineering evaluation, uncertainty exists with respect to site and subsurface conditions; material conditions and distribution; the nature and extent of contamination; engineering constraints; the implementability, performance and effectiveness of various actions and equipment; unit costs, cost scaling, and other economic considerations; and other factors. In performing the work necessary to complete the SFS, it is EPA's and EMSI's intent to develop and consider a reasonable range of assumptions as necessary to address potential uncertainties that could have a material impact on implementability, potential impacts, costs or duration of each alternative.

Sufficient explanations of scientific and engineering concepts and technical rationales that may not be familiar to or readily recognized by the general public will be provided in the SFS.

2 Engineering Evaluations

Various additional engineering evaluations need to be performed prior to evaluation of the "complete rad removal" alternatives pursuant to the threshold and balancing criteria specified in the NCP. The nature and scope of the additional engineering evaluations are described below.

2.1 Identification of Soil for Removal Evaluation

Per EPA's January 11, 2010 letter, the SFS will examine remedial alternatives for "complete rad removal" from the radiologically contaminated areas (Areas 1 and 2 and the Buffer Zone/Crossroads properties). For purposes of this analysis, EPA (EPA, 2010b) has defined "complete rad removal" to mean attainment of the risk-based radiological cleanup levels specified in OSWER directives 9200.4-25 and 9200.4-18 (EPA, 1998a and 1997).

2.1.1 OSWER Directives

As indicated above, EPA has defined "complete rad removal" to mean attainment of the risk-based radiological cleanup levels specified in OSWER directives 9200.4-25 and 9200.4-18 (EPA, 1998a and 1997). The following subsections discuss the potential applicability or relevance and appropriateness of the specific regulations and procedures addressed by these guidance documents.

OSWER Directive 9200.4-25, titled "Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites" (EPA, 1998a) discusses the applicability, relevance and appropriateness, and use of the soil cleanup standards established pursuant to the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 at CERCLA sites. As set forth in this guidance, EPA has determined that the surface soil standard for cleanup of soil at UMTRCA sites (5 pCi/g plus background) would only be applicable to cleanup of uranium mill tailings at the 24 uranium mill tailing sites designated under Section 102(a)(1) of UMTRCA (Title I sites). West Lake Landfill is not a Title I site and therefore these standards are not applicable to remedial actions for the West Lake Landfill.

This guidance indicates that these standards may be relevant and appropriate to CERCLA sites that contain soil contaminated with radium-226, radium-228 and/or thorium isotopes. These standards are considered relevant, because the radiologically-impacted materials in waste materials within OU-1 contain radium-226, radium-228 and thorium and were originally disposed as contaminated soil. These standards are not considered to be appropriate, however, as they do not address conditions that are sufficiently similar to the West Lake landfill. The standards established pursuant to 40 CFR 192 Subpart B were not developed or intended to address conditions at solid waste disposal units.

Furthermore, as indicated in the guidance, "The purpose of these standards was to limit the risk from inhalation of radon decay products in houses built on land contaminated with tailings, and to limit gamma radiation exposure of people using contaminated land." These standards are relevant, because limiting gamma radiation exposure of individuals on or near the West Lake Landfill is an important remedial action objective for the Site. There is no reasonable expectation, however, that homes will be built upon Radiological Areas 1or 2 in the future. The West Lake Landfill is a solid waste landfill that is already subject to controls on future land use that would prevent construction of houses over the waste materials regardless of whether radiologically-impacted materials were present or not.. Institutional controls to restrict residential use of the property have previously been developed and implemented by the owners of the West Lake Landfill properties, including OU-1, OU-2 and other portions of the landfill properties. In addition, implementation of institutional controls to restrict future use of solid waste disposal sites is required by the Missouri Solid Waste Regulations (10 CSR 80-3.010(20)(C)2.C.II). Furthermore, EPA has indicated in the Statement of Work that even if a "complete rad removal" alternative were to be implemented, waste materials would still remain on site thereby requiring these institutional controls. Consequently construction of houses or future use of the landfill area for residential or other unrestricted uses is prohibited. Therefore, the standards established pursuant to 40 CFR 192 Subpart B do not address situations sufficiently similar to those present within the solid waste management units at the West Lake Landfill.

It should be noted that as stated in the guidance, the standards established pursuant to 40 CFR 192 Subpart B do address cleanup of so-called "vicinity" sites at which cleanup of specified off-site properties for unrestricted use is authorized. As these areas are related solely to the 24 Title I sites, they are not applicable to remedial actions at the West Lake Landfill. Previous overland gamma surveys and surface soil sampling have indicated that soil containing radionuclides has been eroded from the surface of Area 2 at West Lake Landfill and was deposited on the surface of the adjacent Buffer Zone and a portion of the Crossroad property. As site development at the Crossroad property has resulted in regrading and placement of surface soil previously located on the Crossroad property onto the Buffer Zone, current conditions relative to occurrences of radionuclides at these properties are unknown but will be the subject of additional investigation and sampling as part of the selected remedy for OU-1. Remaining occurrences of radionuclides, if present, on the Crossroads property would represent a condition that may be sufficiently similar to the conditions associated with the "vicinity" properties addressed by the regulations. As such, the standards established pursuant to 40 CFR 192 Subpart B may be relevant and appropriate to any remedial actions taken to address radionuclides in soil at the Crossroads property.

Although the standards established under 40 CFR 192 Subpart B are neither applicable nor relevant and appropriate to the solid waste landfill areas at the West Lake site, they do represent standards that have been established by EPA for cleaning up radionuclide occurrences so as to allow for unrestricted use. EPA (2010d) has indicated that "One intent of the 'complete rad removal' alternatives, if implemented, would be to leave disposal areas 1 and 2 in a condition that would not require additional engineering and institutional controls due to their radiological content, if feasible." The standards established pursuant to 40 CFR 192 are intended to allow for unrestricted use of land relative to radionuclide occurrences. Therefore, although these regulations and standards are neither applicable nor relevant and appropriate to the conditions at West Lake Landfill, they will be considered in the SFS as part of the development and evaluation of "complete rad removal" alternatives. For purposes of the SFS, these criteria will be referred to as cleanup levels for the evaluation of the "complete rad removal" alternatives.

OSWER Directive 9200.4-25 further determined that for CERCLA sites where subsurface contamination exists at a level between 5 pCi/g and 15 pCi/g averaged over areas of 100 square meters, conditions would not be sufficiently similar to an UMTRCA site to consider the subsurface soil standard of 15 pCi/g over background as a relevant and appropriate requirement. Under these instances, EPA recommends 5 pCi/g as a suitable cleanup for subsurface contamination, if a site-specific risk assessment demonstrates that 5 pCi/g is protective. EPA goes on to further state that when the UMTRCA standards are found to be relevant and appropriate requirements for a CERCLA site, the 5 pCi/g standard should be applied to the combined levels of radium-226 and radium-228. EPA also determined that in order to provide reasonable assurance that the preceding radionuclides in the series will not be left behind at levels that will permit the combined radium activity to build-up to levels exceeding 5 pCi/g after completion of the response action, the 5 pCi/g standards should also be used as a relevant and appropriate requirement for cleanup of the combined level of thorium-230 and thorium-232.

OSWER Directive 9200.4-18 titled "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA, 1997) provides clarifying guidance regarding protection of human health at CERCLA sites containing radionuclides. This guidance identifies potential applicable or relevant and appropriate requirements (ARARs) of other regulations relative to radionuclide occurrences at CERCLA sites. In particular this guidance indicates that where ARARs are not available or are not sufficiently protective, EPA generally sets site-specific remediation levels for: (1) carcinogens at a level that represents an exceedance of upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}; and, (2) non-carcinogens such that the cumulative risks from exposure will not result in adverse effects to human populations (including sensitive sub-populations) that may be exposed during a lifetime or part of a lifetime, incorporating an adequate margin of safety. Since all radionuclides are carcinogens, this guidance addresses carcinogenic risk.

2.1.2 Evaluation of Soil Cleanup Levels for "complete rad removal"

OU-1 at the West Lake Landfill addresses contamination in a former solid waste landfill that includes layers, lenses or other bodies of soil that contain radium, thorium, and uranium isotopes and their radioactive decay products. EPA previously determined that the UMTRCA soil cleanup standards established under 40 CFR 192 Subpart B were not applicable but were relevant and appropriate to cleanup of soil containing radionuclides at the Buffer Zone/Crossroads properties adjacent to Area 2. As indicated above, radium and thorium isotopes are present in soil contained within the overall mass of solid waste materials located within OU-1. As the intent of the SFS is to evaluate alternatives for "complete rad removal", engineering measures and institutional controls will not be required to address the remaining levels of radionuclides in OU-1 if one of the supplemental alternatives were to be implemented. Specifically, the intent of the "complete rad removal" alternatives is to remove radiologically-impacted materials from OU-1 to the degree necessary to allow for unrestricted use of the OU-1 areas relative to the presence of radionuclides. Therefore, although the cleanup standards established under the UMTRCA regulations as modified and clarified by the two EPA guidance documents referenced above and in the Statement of Work, are not considered relevant and appropriate requirements for the West Lake Landfill, they will be considered as cleanup levels for purpose of evaluation of the "complete rad removal" alternatives that are the subject of the SFS.

A Baseline Risk Assessment (BRA) [Auxier & Associates, 2000] was completed as part of the RI (EMSI, 2000). The highest level of potential risk to human health identified in the BRA was a 2 x 10^{-4} future risk for a groundskeeper working in Radiological Area 2. This risk was based on an expected future average activity level for radium-226 plus its eight daughter products of 1,524 pCi/g. Under the "complete rad removal" alternatives, the combined levels of radium and thorium isotopes that would remain at the site if one of the "complete rad removal" alternatives were to be implemented would be 5 pCi/g plus background. This represents an approximately 300 fold reduction from the projected future average level of radium-226 which should result in an approximately 300-fold reduction in the projected risk level, reducing the maximum projected risk level identified in the BRA to approximately 1 x 10^{-6}. As a result, use of the 5 pCi/g plus background cleanup level, set forth in UMTRCA regulations as modified by the referenced EPA guidance documents, should result in a cleanup level that is protective of public health.

The radiological cleanup levels specified in OSWER directive 9200.4-25 are total radium 226 + 228 greater than 5 pCi/g (above background) and total thorium 230 + 232 greater than 5 pCi/g (above background). As a result, it must be noted that the so-called "complete rad removal" alternatives would not result in complete removal of all radionuclides from the landfill but would only result in removal of radionuclides to a level such that engineering measures and institutional controls intended to address radionuclide occurrences at the Site would no longer be required. EPA policies pursuant to CERCLA and the NCP do not, in fact, require removal of all radionuclides. The radionuclide levels that would remain within Radiological Areas 1 and 2 under the "full rad removal" alternative are below levels that would be protective of human health for reasonably expected future exposure scenarios.

There are no ARARs or established cleanup levels for uranium. The ROD for the St. Louis Downtown Site (SLDS) [EPA, 1998b] and the 2005 ROD for the St. Louis Airport

Site (SLAPs) [EPA, 2005] were reviewed relative to the uranium cleanup level established by EPA for other sites in St. Louis area that contained uranium and other radionuclides in soil. The SLDS ROD indicated that the point of departure (10^{-6}) remediation goal for U-238 would be 2.6 pCi/g, based upon an analysis using {add citation to pertinent risk calculator} model; however, this value is within the range of site background concentrations (0.159 to 3.78 pCi/g for 32 sample detects). EPA also concluded that the point of departure concentration would present significant issues with respect to implementability. Therefore, so as to enable field measurement of U-238, preclude the cost for over-excavation of clean soils, and facilitate statistical confirmation of the cleanup, EPA adjusted the remediation goal upward to 50 pCi/g. EPA determined that this level would be protective of human health in that it corresponds to a risk of less than 2 x 10^{-5} without regard to the presence of clean soil cover that would be placed over the excavation areas. EPA further concluded that this value is a valid, supportable remediation criterion for the SLDS Site given that actual residual concentrations are generally substantially less than the applicable criterion, and is further appropriate given the need to minimize over-excavation of soils and the associated costs.

For SLAPS, a site-specific remediation goal for U-238 was derived based on the approach described in 10 CFR 40, Appendix A, Criterion 6(6), also referred to as the benchmark dose approach. The U-238 remediation goal was established using U-238 as a surrogate for all of the uranium isotopes (including U-234 and U-235) and certain uranium decay products. The SLAPS ROD indicates that the remediation goal for U-238 was calculated to be 81 pCi/g when used as a surrogate for total uranium. The U-238 remediation goal was revised downward to 50 pCi/g to account for Pa-231 and Ac-227 concentrations that are present above their expected natural abundance.

Based on the uranium remediation goal of 50 pCi/g established for the SLDS and SLAPs, for purposes of performing the SFS for "complete rad removal" alternatives, a cleanup level of 50 pCi/g will be used. The highest risk level calculated in the BRA for uranium-238 and its daughter products was 5 x 10^{-8} for a future storage yard worker working in Area 2. This risk estimate was based on a projected average uranium activity level of 15.7 pCi/g which is approximately one-third of the proposed cleanup criteria of 50 pCi/g plus background. Therefore, the risk level associated with the proposed cleanup level would be approximately three times higher than the risk level calculated in the BRA, which would still be less than the 1 x 10^{-6} point of departure established by EPA for carcinogenic risk.

2.1.3 Soil Cleanup Levels

Background concentrations of the various isotopes of radium, thorium and uranium are presented in Section 6.2 of the RI report (EMSI, 2000). These background concentrations were determined using analytical results from samples collected at four background locations. In order to account for the variability in the background results, the representative background values used in the RI are the mean values of the four results plus two standard deviations. These representative background concentrations are listed below:

Mean + 2 sigma values for background samples cited in RI

- Radium-226 = 1.30 pCi/g
- Radium-228 = 2.37 pCi/g
- Thorium-230 = 2.45 pCi/g
- Thorium-232 = 1.55 pCi/g
- Uranium-238 = 2.24 pCi/g
- Uranium-235 = 1.15 pCi/g
- Uranium-234 = 2.73 pCi/g

Collection of additional background samples to provide a larger data set for use in estimating background values or incorporation or use of background values obtained from other studies conducted in the general area of the site (such as SLAPS) may need to be performed if one of the "complete rad removal" alternatives were selected for implementation at the site.

Each of these radionuclides are members of either the uranium-238 or the thorium-232 decay chains. The short lived members of these chains should be in equilibrium with longer-lived progenitors in the same chain. For example, thorium-232 and radium-228 are members of the thorium-232 decay series and should be in equilibrium with each other in this material. Examining the results listed above, it can be seen that they are noticeably different. These differences likely result from variations in the analytical results obtained from the four samples combined with the effects of averaging the results and incorporation of two standard deviations about the results to address the overall variability of the sample results.

In order to address the difference in activity levels of the parent and daughter radionuclides in the SFS, the representative background concentration for all short-lived members of a decay chain will be set to the lowest value calculated for any member in the chain. This is a small adjustment that results in a slightly lower derived concentration guideline (DCGL) slightly. In the case of the thorium-232 series, the background concentration of all members of the thorium-232 series will be set to1.55 pCi/g in this study. Applying this same logic to the remaining radionuclides, the background values to be used for series nuclides in this evaluation are as follows:

- Radium-226 = 1.3 pCi/g
- Radium-228 = 1.55 pCi/g
- Thorium 232 = 1.55 pCi/g (parent of Ra-228)
- Thorium-230 = 1.3 pCi/g (parent of Ra-226)
- Uranium-238 = 2.24 pCi/g (parent of U-234)
- Uranium 234 = 2.24 pCi/g (parent of Th-230)

These values are comparable to the following background values identified for SLAPS (EA, 1998):

- Radium-226 = 2.8 pCi/g
- Radium-228 = not identified
- Thorium 232 = not identified
- Thorium-230 = 1.9 pCi/g
- Uranium-238 = 1.4 pCi/g
- Uranium 234 = not identified

The resultant cleanup values to be used to identify the site soils that will be the subject of the evaluation of the "complete rad removal" alternatives will be the sum of the representative background concentrations and the appropriate risk-based remediation concentrations listed in the OSWER directives; that is 5 pCi/g plus background. Based on the site background values presented in the RI (EMSI, 2000) the site cleanup values would be as follows:

- Radium-226+228 = 7.9 pCi/g[1]
- Thorium-230+232 = 7.9 pCi/g

[1] Total radium DCGL = 1.3 pCi/g radium-226 + 1.6 pCi/g radium-228 + 5 pCi/g total radium cleanup concentration
= 7.9 pCi/g radium

The RI (EMSI, 2000) and pre-RI (RMC, 1982 and NRC, 1998) data will be reviewed to identify those soil borings and depth intervals that contain radium, thorium, and/or total uranium activity levels greater than these cleanup values. In the event that the results for one or more of the isotopes were reported as being less than the minimum detectable activity (MDA) value, a surrogate value of one-half the MDA value will be used for the particular isotope.

In addition to review of the soil sample results, the results of the downhole gamma logging will also be used to define areas and depth intervals that likely contain soil with radionuclide levels above the cleanup levels. As there is not a direct correlation between the downhole gamma results and the results of soil sample analyses, the downhole gamma logs will be visually reviewed and qualitatively evaluated to identify additional locations and depth intervals where soil containing radionuclides above the cleanup levels are expected to be present.

As only graphical portrayals of the overland gamma survey results are available, these results will be qualitatively reviewed to insure that areas with elevated overland gamma results that may reflect occurrences of soils with radionuclide levels greater than the cleanup levels are also included in the delineation of the areas with soil above the cleanup levels.

The results of these evaluations will consist of tabulation of the locations and depth intervals that contain, or are likely to contain radionuclide occurrences above the stated cleanup levels. The survey data for these locations and the depth intervals will be tabulated to identify the location and elevation of the intervals that contain, or are likely to contain radionuclides above the cleanup levels. These locations and depth intervals will then be extrapolated spatially {?} to identify general zones where radionuclides are expected to be present at activities greater than the cleanup levels (see discussion in Section 2.3 below).

2.2 Identification of Volumes of Soil to be Excavated and Disposed

The volume of soil to be excavated from the Buffer Zone/Crossroads properties will be estimated based on the results of the design-phase field investigations discussed above.

For Areas 1 and 2, the Project Team will use the results of the evaluations described in Section 2.1 to identify the waste materials containing radionuclides above the cleanup levels. Intervals containing or suspected to contain radionuclide activities above the cleanup levels will be plotted in three-dimensions and located within the overall waste mass. By using computer-assisted volumetric calculating software, a volume projection will be estimated for both the waste materials containing radionuclides above the cleanup levels and the overburden waste which must be removed in order to excavate the underlying radiologically-impacted materials.

The Project Team will use the AutoCAD Civil 3D 2010 software (AutoCAD 2010) to portray the lateral and vertical extent of the radiologically-impacted materials and estimate the volumes of radiologically-impacted materials and overlying waste materials. This program generates surfaces of a layer of interest, and then uses a volume calculation algorithm to estimate the in-place volume between two defined surfaces. A surface is the three-dimensional geometric representation of an area of land. Surfaces are developed by triangles or grids, which are created by either three-dimensional contours (from an aerial topography), or from a series of three dimensional points (x,y,z).

The AutoCAD Civil 3D 2010 software uses the defined surfaces to calculate a volume by subtracting the difference in elevations within the specific grid, and multiplying the difference in elevation by a grid area. The surface is broken into several smaller grid areas, and the total volume adds the incremental volume calculated from each sub-grid area. Evaluation of the "complete rad removal" will include development of estimates of the volumes of soils and wastes projected to be excavated as overburden and the volumes of soils and wastes (radiologically-impacted materials) to be excavated for offsite disposal or disposal in a new onsite disposal cell for both Areas 1 and 2 of OU-1.

For both Areas 1 and 2 of OU-1, a surface will be created based upon the starting and ending elevations of the waste materials containing radionuclides above the cleanup levels as estimated by the analysis described in Section 2.1 of this Work Plan. From the boring data, a beginning surface and an ending surface will be generated by connecting the three-dimensional point data between borings. Assumptions relative to layer termination will be discussed in detail. In addition, if there are multiple layers within a vertical column of a boring, multiple volumes may be required. These calculations will be presented in the SFS Report.

For both Area 1 and Area 2 of OU-1, the volume of the overburden waste materials (not containing radionuclides) will be calculated by creating a surface from the latest aerial topography, and comparing that surface to the top of the waste materials containing radionuclides above the cleanup levels. This volume must be removed to access the waste materials containing radionuclides above the cleanup levels. Allowable excavation slopes in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations to minimize waste excavation will also be investigated in the SFS.

As discussed in Section 2.3.2.2, the required overburden removal volume to exhume the waste materials containing radionuclides above the cleanup levels may consist of waste materials that do not include radiological materials or in some instances native soil located adjacent to the waste materials. Excavation of the radiologically-impacted materials would likely not only entail excavation of overlying soil and waste materials, but could also require excavation of waste materials or native soils located adjacent to the radiologically-impacted materials in order to provide suitable side-slopes for the waste excavation activities. The configuration and volume of any waste materials/native soil that would need to be excavated or laid-back in conjunction with the excavation of the radiologically-impacted materials will be calculated.

All generated overburden material and related material needed to be excavated to safely access the waste materials containing radionuclides above the cleanup levels would need to be properly managed. For purposes of the SFS it is assumed that the most cost-effective method for management of the non-radiologically impacted waste materials would be to stockpile these materials near the excavation areas and replace them into the excavation. Evaluation of MDNR requirements and possible waivers necessary to allow for temporary stockpiling of excavated waste materials will be evaluated as part of the SFS. Double-handling of the overburden materials would occur as a result of initial excavation, stockpiling, temporary covering, and control of runon, runoff and leachate followed by replacement, regrading and capping these materials. This will result in additional costs. Therefore, the cost of disposing of the overburden wastes, either in the newly-constructed disposal cell as part of the on-site disposal option, or alternatively at an off-site solid waste disposal facility or offsite radiological waste disposal facility, will also be evaluated as part of this SFS. Evaluation of the two options for the disposition of the overburden material and related material (i.e., [1] stockpiling and replacement into the excavation, and [2] disposal in the newly-constructed on-site disposal cell or in an off-site waste disposal facility) will require the preparation of two final grading plans and cover designs.

Regardless of the approaches taken in performing the SFS evaluations, there will be a large degree of uncertainty associated with the volume estimates. This uncertainty arises from the limits on the accuracy of the existing site topographic mapping, which is based on aerial photogrammetry without ground control producing, at best, a topographic surface with a tolerance of approximately one foot. In addition, past subsurface investigations of the site were focused on providing information on the general nature and extent of occurrences of radiologically-impacted materials. The current understanding of the lateral and vertical extent of the radiologically-impacted materials is based on data density derived from approximately one soil boring per acre. This information was determined to be sufficient to characterize the potential risks posed by the site and to identify and evaluate potential remedial alternatives for the site. For purposes of the SFS evaluation, the volume of radiologically-impacted materials is the single largest factor affecting the potential costs of the "complete rad removal" alternatives.

2.3 Excavation Plan

A conceptual excavation plan would be developed for the exhumation of the waste materials containing radionuclides above the cleanup levels within Area 1 and Area 2 of OU-1. The excavation plan should be similar for both off-site and on-site disposal alternatives. The excavation plan would provide details pertaining to the methodology of exhumation of the waste materials containing radionuclides above the cleanup levels, temporary storage of the overburden waste and soils, and the reclamation plan once the radiologically-impacted materials have been removed. These plans would be presented in the SFS Report.

2.3.1 Excavation Phasing and Staging

Based upon the estimated defined horizontal and vertical limits of the waste materials containing radionuclides above the cleanup levels and the calculated allowable slopes and overburden depths, estimated lines of projection or "daylight" lines would be surveyed. The SFS will identify the location of these daylight lines based upon the three-dimensional projections of the waste relocation limits. Details will be provided to discuss how the affected areas would be cleared of vegetation, how the overburden waste would be excavated and stockpiled in pre-defined areas, and how the waste materials containing radionuclides above the cleanup levels would be identified, removed, processed, and ultimately transported out of the Area 1 and Area 2 boundary of OU-1.

A general description of how radiological materials have been successfully removed at other sites follows:

1) An experienced radiological technician would survey and sample the working face to determine the extent of any radiological material present. The technician would clearly mark any impacted areas with paint or flagging.
2) The excavator would remove a layer of waste materials from the marked area and transfer the waste materials to haul trucks.
3) The surveyor and the excavator would repeat steps one and two until the technician determines that the area may meet release criteria.
4) The area is then sampled and scanned as part of the final status survey for that area.
5) If the scanning and analytical data indicate the area meets release criteria, the excavations would be backfilled in accordance with the approved remedial design documents. If the final status survey finds additional contamination, the process returns to Step 1 until the area does pass.

A conceptual strategy will be developed in the SFS to transition the waste materials containing radionuclides above the cleanup levels from off-road haul trucks to on-road transfer vehicles for the off-site commercial disposal alternative.

2.3.2 Equipment Requirements

"Complete rad removal" would be expected to entail exhumation of waste materials using a hydraulic excavator(s) and off road haul trucks to remove the overburden, exhume the waste, and reclaim the excavated areas. Dozers would be used to clear the affected areas and provide grading during the construction project. On road trucks (and if rail is used, a rail transfer facility) would be used for any off-site disposal option. The design of the truck to rail transfer facility would be required if this option is selected. In order to control any potential emissions during transfer activities, it is envisioned that this facility would be an enclosed structure complete with climate controls.

Other equipment would be used to process the waste and reclaim Area 1 and Area 2 of OU-1. The types of equipment that would be used for this exhumation and reclamation effort and the analytical equipment needed to control the excavation will be identified in the SFS. This would aid with the project scheduling requirements, project costs, and assessing the exposure of the construction workers and oversight staff for evaluation of "complete rad removal" alternatives.

2.3.3 Production Rates

The types of equipment that would be used for this exhumation and reclamation effort (as discussed in Section 2.4.1.1) will be identified in the SFS. The equipment production rates will be investigated by exploring typical manufacturer data and published construction cost estimating software to estimate the number and type of pieces of equipment needed, the time frame for construction, and for cost estimating purposes.

2.3.4 Material Volumes

The material volumes as discussed in Section 2.3.2 would consist of waste materials containing radionuclides above the cleanup levels, the waste overburden, and soil overburden. The in-place soils and wastes would have a certain compaction level, or density. This is often referred to as "Bank Cubic Yards". Once the soils and waste materials are loaded using excavation equipment, the volume of the materials will expand. This volume is often referred to as "Loose Cubic Yards". Upon placement and compaction, the volume of the excavated materials would be reduced but the final in-place density is likely to differ from the original in-place density. The literature will be reviewed and historical project experience used to attempt to approximate these bulking and compaction factors, as they will affect project schedules, costs, and quantities. This phenomenon would apply to both the on-site disposal and off-site disposal options as well as to the various material handling and transport activities.

2.3.5 Material Handling

Material handling procedures will be discussed in the SFS. This will include the methods used to identify material for removal, preferred methods of excavation, the labor involved, and daily procedures that would be followed to provide for effective removal and reclamation including procedures to identify the contaminated material during the excavation and to determine when the contaminated materials have all been removed.

The material handling plan will also discuss requirements for temporary stockpiles including staging, temporary covering at the end of shifts, diversion of surface water runoff around any piles, management of any leachate generated from the piles. MDNR restrictions on temporary stock-piling of wastes will be evaluated and if determined to be ARARs, a basis for a waiver, if needed, will be presented. Alternatively, the materials handling plan may include requirements associated with off-site disposal of the excavated non-radiologically impacted waste materials that lie over or adjacent to the radiologically impacted materials.

The material handling plan will also address handling of any special wastes such as liquid wastes, hazardous waste, or asbestos-containing material (ACM) if such wastes are encountered during excavation of the radiologically impacted materials. The material handling plan would aid with the project scheduling requirements, project costs, and assessing the exposure of construction workers and oversight staff.

2.3.6 Controlling the Spread of Contamination

Access to areas containing radiological materials would be limited to remediation workers during the excavation. Equipment and personnel entering and leaving these controlled areas would be surveyed and, if necessary, decontaminated before moving into uncontaminated areas. Prior to leaving the site, vehicle monitoring and decontamination would be required for highway trucks used to transport excavated material for offsite disposal and for any other vehicles that may enter areas containing radiologically impacted materials. The costs associated with the monitoring and personnel and equipment decontamination efforts and the necessary production delays will be evaluated for each alternative.

2.3.7 Dust/Odor Control

Waste relocation and exhumation can generate excessive dust and nuisance odors. The SFS will discuss potential concerns and impacts associated with dust and odor emissions and evaluate the anticipated effectiveness of commonly accepted industry standard procedures to address these issues. Procedures to be evaluated include, but will not necessarily be limited to application of a daily soil cover or alternative daily covers, odor mitigation products, as well as moisture conditioning and other dust suppression techniques/products.

Perimeter and work site air monitoring as part of the radiological monitoring program for worker and public safety are discussed in Section 2.11. A monitoring program and parameters to assess the effectiveness of dust and odor mitigation measures in conjunction with the radiological monitoring program will be developed in the SFS.

2.3.8 Surface Water/Leachate Control

Conceptual design phase surface water management and leachate control plans will be developed for the SFS. Since the exhumation process of waste materials containing radionuclides above the cleanup levels would involve excavated depressions, storm water would collect within these temporarily created depressions. The surface water management plan will discuss techniques for diverting storm water around the work area. In addition, the leachate management plan will discuss methods to handle and dispose of leachate that may be encountered during the exhumation process, or could be generated by storm water commingling with the exposed refuse. Leachate removal techniques, management practices, and treatment and disposal options will be discussed in the SFS.

2.3.9 Impacts to Airport Operations/Mitigation Approaches

The SFS will investigate the waste exhumation process as it affects local airport operations, specifically the Lambert-St. Louis International Airport. Missouri Solid Waste Regulations (10 CSR 80-3.010 (4)(B)1) restrict landfill siting and operations located within 10,000 ft of runways used for jet aircraft. Radiological Area 1 at the West Lake Landfill is located just inside of 10,000 feet of the west end of the recently completed western-most runway at the airport, while Radiological Area 2 is located just inside of approximately 12,000 feet of the west end of the western-most runway. Available techniques to minimize bird populations during the waste exhumation process to reduce bird hazards to aircraft will be identified and their anticipated effectiveness will be evaluated in the SFS.

2.3.10 Coordination/Impacts to other Site Uses/Activities

The SFS will also discuss how the on-site disposal in an engineered disposal cell alternative or the off-site commercial disposal alternative would affect the other operations within the defined facility boundary (owned property). For example, transport of excavated waste to an on-site engineered disposal cell or to an offsite commercial facility could impact the internal site truck traffic associated with the existing solid waste transfer station, concrete plant and asphalt batch plant as well as traffic along St. Charles Rock Road at the point of ingress and egress to the site. Possible limitations with basic site services (e.g., electrical service, water supply) that could affect implementation of the "complete rad removal" alternatives or alternatively could affect other site business will be identified in the SFS. Use of an on-site engineered disposal cell or trucking of wastes offsite could require additional health and safety monitoring and precautions for other site workers not involved in the remedial actions. For the off-site commercial disposal alternative, decontamination of trucks prior to leaving the site may be required. The need for, requirements, and impacts to other site activities will be evaluated in the SFS.

2.3.11 Methane Gas Emergency Action Plan

A Methane Gas Emergency Action Plan will be developed as part of the SFS. Such a plan would be necessary as in-place waste would potentially be disturbed. The project Health and Safety Officer would be responsible for excavation and perimeter monitoring for methane and hydrogen sulfide gases. On-site monitors would be established and maintained for the duration of the excavation activities. Applicable local, State, and federal regulations would be adhered to. Additional details on the Methane Gas Emergency Action Plan will be included in the SFS and would be included in the Site Safety Plan for remedy implementation.

2.4 Sampling and Analysis Plan

As part of the SFS, a conceptual sampling plan will be developed to provide details about the sampling and survey techniques to be used to identify contaminated materials during excavation and upon completion of the excavation activities in a given area to document that all of the materials that exceed the cleanup levels have been removed.

2.4.1 Excavation Control Surveys and Sampling

It is expected that any excavation of radiological materials would be controlled by qualified technicians using a combination of walkover field survey equipment and solids sampling to identify impacted materials above the removal criteria. The SFS will evaluate available equipment and methods to determine the most cost-efficient way to perform real-time monitoring of the radiological status of materials on the working face.

2.4.2 Final Status Survey and Sampling

It is anticipated that a final walkover survey, including radiological scans of exposed areas and sampling of soil/trash at the base of the excavation would need to be performed as part of the "complete rad removal" alternatives to document that soils and materials containing radionuclides above the cleanup levels have been removed. Verification sampling would need to demonstrate compliance with the UMTRCA standards (40 CFR 192.12) relative to radium-226 in surface soil, as modified to reflect the cleanup levels established by EPA in the Statement of Work (EPA, 2010b). Specifically, post-excavation soil samples would need to be collected to demonstrate that at the completion of the excavation activities, the remaining soil does not contain total radium (radium-226 and radium-228) or total thorium (thorium-230 and thorium-232) at concentrations greater than the cleanup levels discussed above. These samples may be analyzed in the onsite lab with a percentage sent to an independent off-site laboratory for verification of the results. Alternatively, all of the samples may be sent to an offsite laboratory, if a laboratory capable of providing quick analytical turn-around can be located. The excavation plan will include actions necessary to keep excavated areas open until the verification sample results are available in the event that the sample results indicate that additional excavation is required to achieve the cleanup goals.

Normally, the approach described in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) would be chosen for this task without further consideration of other methods. However this particular application poses some conceptual problems for a MARSSIM-based final status survey methodology[2]. MARSSIM and other methods will be evaluated in the SFS and a scientifically-sound method will be selected and described. It is expected that the final survey method will integrate scanning and sampling activities. The costs and scheduling concerns associated with this survey method will then be evaluated in the SFS.

2.4.3 Establishment and Maintenance of On-site Laboratory

It is anticipated that the majority of the samples collected would be analyzed in an on-site laboratory but that a smaller percentage of the samples (perhaps 10 to 20%) would be submitted to an off-site analytical laboratory for quality assurance purposes. An on-site laboratory would be equipped with the most up-to-date analytical equipment available. The intention of the on-site laboratory would be to be able to identify Th-230 at the 5 pCi/g level with a high degree of confidence. In practice, no excavated area where the final survey has been completed would be backfilled until the off-site analytical results for Th-230 are reported to and considered by remediation managers. The costs associated with establishing and maintaining an on-site laboratory will be evaluated in the SFS. The on-site laboratory will also be used to conduct real- or near real-time monitoring or for preparation of samples for offsite laboratory analyses to assist in evaluation of environmental conditions such as dust emissions during the excavation activities. Additional discussion of environmental and health and safety monitoring is presented in Section 2.11 below.

2.5 Soil/Waste Segregation Evaluation

An evaluation will be performed in the SFS to assess whether the radiologically-impacted soil that is present with landfilled waste materials in Radiological Areas 1 and 2 could be mechanically separated from the waste materials. Based upon the evaluation of the radionuclide materials above cleanup levels described in Section 2.1, the three dimensional distribution of the materials to be removed may vary in Radiological Area 1 and Area 2 of OU-1. In Area 1, the radionuclide materials above cleanup levels are located in a contiguous horizontal area between 0 and 17 feet below the surface, represented by elevations between 438 and 470 feet amsl. The radionuclide materials above cleanup levels in Area 2 are distributed in a more complex spatial orientation. Horizontally, the radionuclide materials above cleanup levels are distributed throughout approximately 60-70% of the Area 1 boundary. Vertically, the radionuclide materials above cleanup levels are between 0 and 49 feet below the surface, represented by

[2] MARSSIM is specifically designed for surface soil, and most of the areas to be remediated are subsurface. In addition, the cleanup criteria contained in UMTRCA are stated as pCi/g averaged over a 100 square meter area and 15 cm depth. MARSSIM does not use averaging criteria. Instead, it uses a non-parametric statistical test to compare groups of samples from areas to a similar number of samples from a "reference area" to test if the area contains soil above a certain concentration. Given the degree of industrial and other development in the area (i.e., building coverage, pavement and landscaping) locating and obtaining access to suitable "reference area(s)" near the site may not be possible.

elevations between 427 and 480 feet amsl. The SFS will quantify the three dimensional distribution of these materials and associated volumes in greater detail.

As cost of any of the excavation alternatives will primarily be driven by the cost of disposal of the excavated materials, methods that may potentially be effective in segregating the overall radiologically-impacted materials from the non-radiologically impacted wastes will be identified. These methods could include more precise identification and excavation of the radiologically-impacted materials (large-scale separation) as well as possible separation of radiologically-impacted soil from non-radiologically impacted solid wastes or construction and demolition debris (small-scale separation). The potential effectiveness, implementability, impacts, and costs of monitoring, identifying and verifying the differences between radiologically- and non-radiologically impacted waste materials during the excavation activities (large-scale segregation) will be evaluated as part of the SFS. These factors will be compared against the anticipated impacts and cost of excavation without field segregation of the radiologically- and non-radiologically-impacted materials and resultant disposal (in an on-site cell or at an off-site facility) of a larger volume of waste material.

The goal of separating the radiologically-impacted soil from the landfilled waste materials (small-scale segregation) would be to further reduce the volume of radiologically-impacted material that would need to be transported and disposed off-site at a commercial facility or disposed in a new on-site engineered disposal cell. The following information will be analyzed as part of the evaluation of the potential effectiveness, implementability, impacts, benefits, and costs of performing soil-waste segregation:

- The type, number, size, capacity, materials of construction, footprint, labor and analytical requirements, and costs of equipment needed to separate the radiologically-impacted soil from the landfilled waste materials;
- Production rates for the separation equipment;
- Type, number, size, capacity, production rates, labor requirements, materials of construction, footprint, and costs of equipment needed to support the separation equipment (e.g., track hoes, front-end loaders, bin surge hoppers, conveyors, off-road and highway trucks, temporary enclosed structures);
- Percentage of segregation expected;
- Any limitations/constraints to segregation;
- Additional labor requirements;

- Operation, maintenance, and monitoring costs for separation and supporting equipment; and
- Potential for exposure to radiologically-impacted material by equipment operators and any laborers, type of exposure, and any personal protective equipment required.

If the results of the evaluation conclude that separating the radiologically-impacted soil from the landfilled waste materials is feasible, an estimate of the volume of separated soil will be prepared to be used in the off-site transportation/commercial disposal alternatives analysis as well as the conceptual design of an on-site engineered disposal cell.

2.6 Applicable or Relevant and Appropriate Requirements

As part of the engineering evaluations for the SFS, potentially applicable or relevant and appropriate requirements (ARARs) of other environmental regulations, standards or criteria will be identified and evaluated. This task will include evaluation of the ARARs identified in the FS report for the site (EMSI, 2006) and in the ROD previously prepared by EPA. The criteria identified in these prior evaluations will be evaluated with respect to their potential applicability or relevance and appropriateness relative to the "complete rad removal" alternatives. Additional (e.g., action-specific) requirements that may potentially be applicable or relevant and appropriate to the "complete rad removal" alternatives, such as criteria or requirements related to the design, operation or closure of the new engineered cell or relative to offsite transport and disposal of the excavated wastes will also be evaluated.

2.7 Off-site Commercial Disposal Alternatives

An analysis of the potential off-site commercial disposal alternatives will be conducted for the SFS. The analysis will involve identifying potential transportation methods and disposal facilities and any limitations/constraints on their use, which would adversely effect implementability of the alternative. In addition, the analysis will evaluate transportation and off-site disposal cost information.

Based on a preliminary search, potential offsite commercial disposal locations for radiologically-impacted material might include the Clean Harbors (Colorado), American Ecology (Idaho), Energy Solutions (Utah), and Waste Specialists (Texas) facilities. These and other potential facilities will be contacted and waste acceptance information will be gathered including waste type limitations, the ability of the facility to accept mixed soil and garbage, radionuclide activity level limitations, volume limitations, limitations regarding other waste characteristics, and whether the facility has direct rail access.

Transportation of radiologically-impacted material to each potential off-site disposal facility will be evaluated, including truck, rail and truck/rail combination methods. The feasibility of constructing a rail link to the West Lake Landfill site and constructing an on-site transfer facility will be assessed. Alternatively, the feasibility of upgrading and using the existing rail transport facility established by the U.S. Army Corps of Engineers (USACE) at the airport site will be evaluated. Potential location(s), design requirements, worker exposure assessment, and estimated capital and operation costs for an off-site truck-to-rail transfer facility will be reviewed. Any truck and rail transportation special requirements and/or limitations; (e.g., routing limitations on rail hauling, railroad-specific rules/regulations, special Department of Transportation (DOT) packaging requirements for rail shipments, or other requirements) will be identified and associated costs will be included in the alternatives evaluation.

Procedures for planning and implementing off-site response actions under CERCLA are specified in 40 CFR 300.440, known as "The Off-Site Rule". The regulation applies to off-site treatment and disposal of "hazardous wastes" that cannot be managed on-site. The Off-Site Rule specifies that USEPA would determine the acceptability of any off-site facility that has been selected for treatment, storage, or disposal of CERCLA wastes. The proposed receiving facility must be operating in compliance with all applicable federal, state, and local regulations, and there must be no relevant violations affecting the receiving unit. Also, there must be no releases from the receiving unit, and contamination from prior releases at the receiving unit as well as any releases from other units located within the receiving facility must be addressed as appropriate. USEPA verifies the acceptability of off-site treatment, storage, and disposal facilities ("TSDFs") on a frequent basis. Consequently, before any off-site shipment occurs, a verification of current acceptability ("VCA") must be obtained from USEPA certifying that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3), 42 USC § 9621(d)(3), and 40 CFR 300.440. Site wastes could only be sent to an off-site facility that complies with the requirements of the statutory provision and regulations cited in the preceding sentence. The provisions of The Off-Site Rule will be considered in the analysis of the potential off-site commercial disposal alternatives.

Transportation and off-site disposal cost information will be collected for inclusion in the cost estimates for each of the "complete rad removal" alternatives. It is anticipated that this information would include rates for soil, soil/garbage (if applicable), and debris disposal; any disposal fees and taxes; and estimates for truck and rail transportation. Waste acceptance information will obtained from potential disposal facilities.

There is a potential that liquid wastes, RCRA hazardous wastes and/or ACM may be encountered during excavation of solid waste materials contained in Radiological Areas 1 and 2. As part of the evaluation of potential off-site disposal facilities, waste acceptance criteria or constraints related to acceptance of these types of wastes will be identified. Additional costs that may be incurred related to identification, characterization, profiling and disposal of radiological wastes containing liquids or mixed with hazardous waste or ACM, which will be identified and considered in the NCP evaluation (see Section 3 below) of the offsite disposal alternative. In the event that no offsite disposal facilities are identified that can accept any or all of these types of mixed wastes (i.e., radiological wastes containing liquids or mixed with hazardous waste or ACM), this condition will be identified as a potential factor affecting the implementability of the offsite disposal alternative.

Off-site disposal of waste materials containing radionuclides above the cleanup levels via trucks would potentially have a significant effect to the local traffic patterns, roads, and highway infrastructure in and around the St. Louis metropolitan area. The potential impacts to traffic and highway structure that may arise if an offsite disposal alternative were to be implemented will be evaluated in the SFS. A qualified, local traffic engineering firm, familiar with the St. Louis metropolitan area, will {may?} be retained to evaluate and quantify the potential impacts, including consideration of applicable local and State regulations and permitting restrictions, if any, that could affect the traffic flow patterns associated with the project.

2.8 On-Site Engineered Disposal Cell

One of the alternatives required by EPA in the January 11, 2010 Statement of Work is to evaluate the alternative of on-site disposal in an engineered cell of the exhumed waste materials containing radionuclides above the clean-up levels if a suitable location outside the floodplain can be identified. For this alternative, multiple steps, described below, will be required in order to properly complete this alternative evaluation. These steps will be identified and evaluated in detail in the SFS.

2.8.1 Cell Siting/Location

The Project Team will review applicable local, State and federal regulatory-specified criteria and regulations, evaluate existing aerial photography/imagery/mapping, conduct site reconnaissance, use site knowledge, and/or interview site personnel to aid in locating an on-site engineered disposal cell. The entire property owned by Rock Road Industries, Inc. is approximately 216 acres. OU-1 and OU-2 are both included in this area. Of the 216 acres, approximately 52 acres are associated with the formerly active sanitary landfill. The remainder of the site is generally divided into the two OU-1 areas, the closed demolition landfill, inactive sanitary landfill borrow area, former leachate pond, and the area currently used/leased predominantly by the Bridgeton Transfer Station ("TS"), Red Bird Concrete, and Simpson Asphalt.

There are three on-site areas which could possibly serve as the site for a new on-site engineered disposal cell. These included the following:

- Area in the northern portion of Radiological Area 2 that could be cleared during the soil excavation effort, and potentially used for construction of a new on-site engineered disposal cell;

- Existing OU-2 soil stockpile area; and

- Existing concrete/asphalt batch plant area and/or existing transfer station area.

Of these three areas, only the existing OU-2 soil stockpile area appears to be located outside of the geomorphic floodplain (Figure 3). Therefore, only this area will be evaluated in the SFS as a potential site for a new disposal cell.

The existing OU-2 soil stockpile area is located to the south of OU-1 Area 1 and the formerly active sanitary landfill. It currently is an open field containing natural in-situ soil and previously stockpiled soil. The soil material is the borrow source for the formerly active sanitary landfill. It is also envisioned for potential use as cover soils for OU-2. The location of this area will be evaluated for proximity to receptors, whether the location would violate any MDNR landfill buffer zone or geologic constraints, and whether the new landfill cell would require a new permit from MDNR.

The soil stockpile area contains stockpiled soil for use in post-closure care of the formerly active sanitary landfill and as potential cover soils for remedial actions for OU-2. Use of this area would require the excavation and relocation of the stockpile soil prior to construction of a new on-site engineered disposal cell. Alternatively, implementation of the OU-1 remedy could be delayed until after completion of the OU-2 remedy so that a portion of the stockpiled soils are removed prior to possible use of this area for construction of a new landfill cell. Other constraints are associated with this area including use of this area would entail construction and operation of the new on-site engineered disposal cell in close proximity to other property owners and business located along St. Charles Rock Road. This location is also the portion of the site property located closest to (within # miles of) the residential properties in the Spanish Village area. As shown on Figure 3, of the three areas that could possibly serve as the location for a new on-site engineered disposal cell, the soil stockpile area is the only site that is not located within the Missouri River geomorphic floodplain.

2.8.2 Floodplain Evaluation

As stated in the USEPA January 11, 2010 Statement of Work, if feasible, the on-site engineered disposal cell should be located outside of the historical Missouri River geomorphic floodplain. The Project Team has evaluated existing publicly-available literature, mapping, imagery, as well as project-related documents. As stated above in Section 2.8.1, the soil stockpile area represents the only area located outside of the Missouri River geomorphic floodplain. For this reason, the SFS will assume this location as the only practical location for the on-site engineered disposal cell.

The SFS will evaluate the potential effects of an Earth City levee-breach and ensuing flood event on both the existing/in-place waste units (i.e., Radiological Areas 1 and 2), which would be upgraded with a new cover pursuant to the ROD-selected remedy for

OU1, and the prospective on-site engineered disposal cell that is described further in Section 2.8.3 herein. This evaluation will include identification of the expected elevation of the flood waters at the Site in the event that the Earth City levee is breached during a 500-year flood event. Estimates will also be made of the anticipated velocity of water flow near the Site and the potential for the flood waters to erode or otherwise impact the integrity of the waste containment structures and waste materials on site. If this analysis determines that such a flood would significantly threaten the integrity of an on-site engineered disposal cell located in the soil stockpile area, then this cell will be deemed not implementable and will not be considered further.

2.8.3 On-Site Engineered Disposal Cell Conceptual Design

As stated above, the soil stockpile area is the location that would be evaluated for placement of the on-site engineered disposal cell. In support of the SFS, a conceptual design of the on-site engineered disposal cell will be prepared by the Project Team in accordance with applicable federal, State, and local regulations.

2.8.3.1 Regulatory Requirements for On-Site Engineered Disposal Cell Design

Both the MDNR solid waste regulations and UMTRCA requirements would need to be considered during conceptual design of the on-site engineered cell disposal alternative. Site selection and suitability requirements established under both of these regulations will be reviewed and evaluated relative to the potential location (existing OU-2 soil borrow area) for construction of an on-site disposal cell. As the new cell would be constructed on-site, no permits would be required; however, in accordance with the NCP, the substantive requirements of the siting and permitting portions of these regulations will be considered during the evaluation of the feasibility of building a new on-site disposal cell.

The conceptual design for a new on-site engineered disposal cell will primarily be based the UMTRCA requirements (40 CFR 192.02). The design will also consider the requirements of the MDNR Solid Waste Regulations (10 CSR 80-3.010) to the extent that such additional requirements do not compromise or diminish the performance of the relevant and appropriate requirements by the UMTRCA regulations. A conceptual cross section of the on-site engineered disposal cell liner and final cover configuration will be prepared for the SFS. In addition, the size of the cell footprint necessary to contain the volume of projected waste materials containing radionuclides above the cleanup levels will be evaluated.

As indicated previously, there is a potential that that liquid wastes, RCRA hazardous wastes and/or ACM may be encountered during excavation of solid waste materials contained in Areas 1 and 2. As part of the evaluation of the design for an on-site engineered disposal cell, regulatory requirements and restrictions related to siting and design of a waste disposal cell for these types of wastes will be identified. In the event that these types of wastes are encountered during excavation, design of the new on-site cell may need to be modified to incorporate any additional requirements or design components. Impacts to the project schedule and additional costs that may be incurred to meet such requirements will be identified and considered as part of the NCP evaluation (see Section 3 below) of the on-site disposal alternative. In the event that regulatory requirements prevent or limit disposal of these types of wastes on-site, this condition will be identified as a potential factor affecting the implementability of the offsite disposal alternative.

2.8.3.2 Hydrogeologic Setting of On-Site Engineered Disposal Cell

In accordance with the MDNR Solid Waste Management Program (SWMP) regulation 10 CSR 80:2.015, the geologic and hydrologic (hydrogeologic) setting of the on-site engineered disposal cell will be described in sufficient detail to allow a thorough evaluation of such. The end result would be compliance with the above regulations and, in the process, confirming the suitability of the soil stockpile site's geologic and hydrologic setting and the use of the Site for the on-site engineered disposal cell.

2.8.3.3 Cover System - On-Site Engineered Disposal Cell

In accordance with the MDNR SWMP regulation 10 CSR 80-3.010 (17)(C)(4)(B) and UMTRCA, the envisioned final cover for the on-site engineered disposal cell would consist of the following layers (from top to bottom):

- 2-ft vegetative soil
- Drainage Layer
- Synthetic liner
- 1-ft (subject to radon emanation evaluation over the projected 1,000 years of risk calculations for the cell) compacted clay liner (10^{-5} cm/sec) The final thickness would be determined by the method described in "Radon Attenuation Handbook for Uranium-Mill Tailing Cover Design, NUREG/CR-3533" in conjunction with the multi-pathway environmental transport model RESRAD – Offsite.
- 2-foot rock/concrete rubble bio-intrusion layer

The properties and requirements for each of these layers are described briefly below.

<u>2-ft vegetative soil layer</u>

This soil layer must be capable of sustaining vegetative growth. It is typically a soil with sufficient organic content and permeability allowing such growth. Soil types such as OH and OL (per the USCS classification system), are often found suitable for this end use. The USDA soil taxonomy system will also be referenced and used to aid in identifying suitable vegetative layer soils. The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS.

Synthetic liner

This liner is a flexible geomembrane material that meets the requirements of 10 CSR 80-3.010 (10)(B)(1)(G). The properties of this liner would be identified and potential vendors, testing requirements, and installation techniques will be discussed in the SFS.

2-ft compacted clay liner

This layer would likely consist of a clay soil material, typically a CL or CH soil-type (per the USCS classification system), and would need to produce a compacted permeability of 1×10^{-7} cm/sec or less. Although the thickness of this layer would be a minimum of two-feet as required by the solid waste regulations, the thickness of this layer could be increased if necessary to provide sufficient radon attenuation to reduce the predicted radon emanation rates below those specified by UMTRCA and to take into account increased radon generation resulting from in-growth of radium over the design life of the cell. The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS.

2-foot rock/concrete rubble bio-intrusion layer

As part of the "complete rad removal" alternative, this layer is included to address UMTRCA requirements pertaining to the long term disposal and landfilling of the waste materials containing radionuclides above the cleanup levels. It would be used to prevent bio-intrusion as well as limit potential erosion of the underlying waste mass. The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS.

2.8.3.4 Liner System - On-Site Engineered Disposal Cell

In accordance with the MDNR SWMP regulation 10 CSR 80-3.010 (9 and 10), the envisioned liner for the on-site engineered disposal cell would consist of the following layers (from top to bottom):

- Leachate collection system
- Synthetic liner

- 2-ft compacted clay liner (10^{-7} cm/sec)

Leachate collection system

Leachate generated from the relocated waste materials would be collected via the leachate collection system. The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS. This system would be designed to maintain a leachate liquid layer head of one (1) foot or less over the underlying layers (described below in more detail). This would require installation of riser pipes that extend from the leachate collection system, up the side-slope of the cell to the ground surface. Submersible pumps would need to be installed in the riser pipes to remove any leachate that may accumulate such that the leachate head over the liner would be maintained at one foot or less. Options for treatment and disposal of leachate will be evaluated as part of the SFS. The leachate collection system would include a drainage layer that would be designed to protect a synthetic liner to the extent that such a liner is included in the conceptual design of a new engineered waste disposal cell.

Synthetic liner

This liner would consist of a flexible geomembrane material that meets the requirements of 10 CSR 80-3.010 (10)(B)(1). The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS.

2-ft compacted clay liner

This layer would likely consist of a clay soil material, typically a CL or CH soil-type (per the USCS classification system), and would need to produce a compacted permeability 1×10^{-7} cm/sec or less. The properties of this layer will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS.

2.8.4 On-Site Engineered Disposal Cell Construction and Operation

Construction of the on-site engineered disposal cell would involve the components as described above in Section 2.8.2.2, and 2.8.2.3. The methods of construction envisioned for the on-site engineered disposal cell will be described in detail within the SFS. This will include describing the borrow source(s) of on-site soil/raw materials, identifying potential third-party sources, means to move and handle the materials, as well as the proper placement and survey of the various project-required materials. The operation of the cell (after completion of construction) will also be discussed in detail. Since the on-site engineered disposal cell would be located in the non-geomorphic floodplain areas, the only option with respect to tying-into existing cells on the Site would be a discrete non-contiguous cell from OU-1 and OU-2. Therefore, no transition liner considerations are required.

2.8.5 Construction QA/QC - On-Site Engineered Disposal Cell

The QA/QC for construction of an on-site engineered disposal cell would meet the requirements of 10 CSR 80-3.010 (6). The methods of QA/QC that would pertain to the construction of the liner and final cover for the on-site engineered disposal cell will be described in the SFS. During construction of any on-site engineered disposal cell, a project-specific QA/QC plan, developed during remedial design, would be followed.

2.8.6 On-Site Engineered Disposal Cell Closure

Closure of the on-site engineered disposal cell described in the SFS would comply with the requirements referenced in Section 2.8.2.1.

2.8.7 Post-Closure Maintenance and Monitoring - On-Site Engineered Disposal Cell

Maintenance and monitoring costs will be estimated and used in preparing the operation and maintenance cost estimates in the SFS for the on-site engineered disposal cell alternative. Since the on-site engineered disposal cell would be located in the non-geomorphic floodplain areas, the only option with respect to tying-into existing cells on the Site would be a discrete non-contiguous cell from OU-1 and OU-2. Therefore, no transition liner considerations would be required. Groundwater and other environmental monitoring necessary to verify long-term containment or otherwise required by ARARs will be identified and a preliminary scope for such monitoring will be developed.

2.9 Closure of Remaining OU-1 Solid Waste Areas Conceptual Design

If waste materials containing radionuclides above the cleanup levels are removed from Areas 1 and 2, only non radiologically-impacted waste materials would remain in these areas. The presence of these wastes would require a final RCRA Subtitle D cap to be constructed over these areas. As the cleanup criteria would have been met, it is assumed that the cover would comply with 10 CSR 80-3.010 (17)(C)(4)(A).

For the ROD-selected remedy, and in the event that the SFS determines that it is not feasible to remove all of the radiologically-impacted materials, a RCRA Subtitle D cap, including additional components such as the biointrusion/marker layer to address the requirements of UMTRCA, would be required in areas that may still contain radiologically-impacted materials. The needed final cover configuration for the closure of the remaining OU-1 solid waste areas will be investigated in the SFS. Regardless of which type of cover is determined to be necessary, the design of the final cover for Areas 1 and 2 will also address the transition into the OU-2 solid waste final cover system.

2.9.1 Final Grading Plan - Remaining OU-1 Solid Waste Areas

In order to safely access and remove waste materials containing radionuclides above the cleanup levels described earlier in this Work Plan, it may be necessary to temporarily handle (excavate and stockpile) overburden waste materials. This overburden waste material would need to be returned to the excavations. A conceptual design-level reclamation plan will be developed in the SFS that would allow the proper, long-term placement of the overburden waste material. It is envisioned that this material would be suitable for backfilling into the excavations of Areas 1 and/or 2, which would aid in the proper regrading of the two excavations and promote positive drainage from the two areas. It is assumed that the design criteria specified for the ROD-selected remedy (e.g., minimum 2% slopes) would also apply to design of the final grades for any waste materials that would remain after excavation of the radiologically-impacted materials. AutoCAD Civil 3D 2010 software will be used during preparation of the SFS to develop conceptual design-level drawings.

Additional conceptual design-level drawings will then be developed and presented in the SFS for the closure of the two areas, with the goal of restoring positive grades off of the areas and establishing sufficient drainage patterns and outfalls/controls.

2.9.2 Capping Plan - Remaining OU-1 Solid Waste Areas

As discussed above in Section 2.9, a conceptual design for a final cover/cap that would cover both OU-1 Areas 1 and 2 will be included in the SFS. The final cover/cap would serve to effectively cover the remaining waste mass in both areas. Per MDNR regulations for existing solid waste landfills without liners (per 10 CSR 80-3.010 (17)(C)(4)(A)), the cap envisioned for Areas 1 and 2 would consist of the following layers (from top to bottom):

- 1-ft vegetative soil; and
- 2-ft compacted clay layer (10^{-5} cm/sec).

The uppermost, one (1) foot soil layer must be capable of sustaining vegetative growth. It is typically comprised of a soil with sufficient organic content and permeability allowing such growth. Soil types such as OH and OL (per the USCS classification system) are often found suitable for this end use.

The two (2) foot compacted clay layer would likely consist of a clay soil material, typically a CL or CH soil-type (per the USCS classification system) with characteristics such that a compacted permeability 1 x 10^{-5} cm/sec or less can be achieved during construction.

The properties of these cover materials will be identified and potential sources, testing requirements, and construction techniques will be discussed in the SFS Report.

2.9.3 Drainage Plan - Remaining OU-1 Solid Waste Areas

Conceptual design for regrading of the final caps for Areas 1 and 2 so positive drainage/grades would be established was described previously in Section 2.9.1. Conceptual design-level AutoCAD drawings presenting the drainage plan to promote long term erosion protection and detailing terraces, letdowns, and related outfalls/controls will be developed during preparation of the SFS.

2.10 Post-Closure Maintenance and Monitoring - Remaining OU-1 Solid Waste Areas

Groundwater and other environmental monitoring necessary to verify long-term containment or otherwise required by ARARs will be identified and a preliminary scope for such monitoring will be developed. An estimate of the duration for post-closure maintenance and monitoring for the remaining solid waste areas will be quantified in the SFS. The typical time period for post-closure for a Municipal Solid Waste landfill is 30 years. Maintenance and monitoring costs will be estimated and used in preparing the operation and maintenance cost estimates included in the SFS for closure of the remaining OU-1 solid waste areas. This monitoring program will be compared to the monitoring program envisioned under the ROD-selected remedy. Any changes to the long-term monitoring program that may result if one of the "complete rad removal" alternatives were implemented will be identified. For example if one of the "complete rad removal" alternatives were implemented, this could reduce the need for long-term monitoring of radionuclides in groundwater or radon gas.

2.11 Assessment of Potential Risks

In the SFS, long-term and short-term risks will be evaluated for the selected remedy in the OU-1 ROD, as well as for the on-site disposal in an engineered cell and off-site commercial disposal "complete rad removal" alternatives. Short-term risks refer to potential risks that may occur during the period of remedy construction and implementation. Long-term risks refer to potential risks that may arise during the post-closure or operations and maintenance period after remedy construction and implementation has been completed. A conceptual model of each alternative will be constructed. This model will provide the basis for the risks and receptors featured in the risk assessment. Where appropriate and/or where site-specific data are not available, the risk assessments will be performed using methods and exposure factors set for in EPA's Risk Assessment Guidance (EPA, 1989, 1991c, 1991d, 2001, 2004, and 2009b). The risk assessment will include evaluation of risks associated with occurrences of radionuclides and non-radiological constituents to the extent that such chemical constituents are anticipated to be encountered during remedy implementation.

For the purposes of this Work Plan, Table 1 lists the sources of the risks to be investigated during this evaluation. Risks may be added or removed as the evaluation progresses. To the extent possible, information on the radionuclides and likely exposure pathways and receptors will be drawn from the existing OU-1 RI, Baseline Risk Assessment, and FS documents. Any updates to toxicity or exposure factors that may have occurred since the Baseline Risk Assessment (Auxier & Associates, 2000) was completed, will be identified and considered in the risk assessments conducted during the SFS.

The risk assessment team intends to use RESRAD-Offsite with the latest slope factors to evaluate radiological risks associated with buried waste materials for the different alternatives at the site. RESRAD-Offsite is an industry-standard computer program that evaluates doses and radiological risks from multiple transport and exposure pathways. It uses the equations presented in HEAST to calculate intakes and risks. Available site-specific data will be used to quantify the physical dimensions of the waste, select the potential receptors, and identify the exposure pathways featured in the modeled simulations. When site-specific data is not available, EPA default parameters will be used to fill the data gaps in the exposure assessment. RESRAD-Offsite default parameters will be used to describe the transport of radionuclides through the environment unless well-documented site-specific information is available. The results obtained using RESRAD-Offsite may be compared to results obtained using an unsaturated zone model such as HYDRUS (EPA, 2000a and 2002a)

To quantify the short-term radiological risks, information related to the actual work process, the number of hours of work, the number of workers, and data quantifying local environmental factors such as meteorological data (likely obtained from Lambert Airport) are necessary. Once this information is available, it will be used to select the representative receptor(s) considered in this risk assessment. This selection process first identifies the group of generic receptor types typically associated with construction tasks of this type. After this initial pool of generic receptors is established, a combination of criteria will be used to focus the assessment on those receptor scenarios that combine reasonable work assumptions with the greatest potential for exposure during the construction activities. These criteria will consider the use of safety procedures and the potential for a receptor to be exposed to materials or radiation during the construction activities. Exposure times and worker proximity to the radiological material will be estimated from the analysis of the work process.

Microshield® will be used to calculate exposure rates from radiological materials to the selected short-term receptors. These exposure rates will be used in conjunction with the exposure times, distances and shielding information from the work process evaluation to estimate maximum credible doses that that may be received by the receptors. These doses will be compared to dose-based exposure limits or radiation standards that are determined to be ARARs (EPA, 1999b). The calculated doses will also be converted to risks using the dose to risk conversion factor of 0.0575 Gy^{-1} in Table 7.3 of Federal Guidance Document 13 (## reference) when necessary. Radon emanation will be estimated from soil concentrations of radium-226 using the method described in NUREG/CR-3533 (NRC, ###).

The construction risks, information related to estimated work process, the number of hours of work by each equipment type, and the number of workers involved will be quantified. Each of the activities performed by workers during construction, maintenance, and monitoring of the various components of the selected remedy in the OU-1 ROD, as well as for the on-site disposal in an engineered cell and off-site commercial disposal "complete rad removal" alternatives, would have certain hazards associated with them. The risks associated with these hazards are quantified in Department of Labor publications and insurance statistics. These risks will be used in conjunction with the labor estimates to calculate the risk of fatality and injury for each activity through the life of each of the remedy alternatives evaluated in the SFS.

Toxic chemical risks would also be evaluated, drawing information from the existing OU-1 RI, Baseline Risk Assessment and FS documents. Any updates to toxicity factors or other factors that may affect risks since the date of the Baseline Risk Assessment will be incorporated.

A post-remediation dose/risk assessment would be prepared using techniques and data that are consistent with the risk assessments performed for each remedial alternative. The latest data would be used whenever possible. For example, risks from radon and radon daughters would be based on actual measured radon-fluxes in the post-remediation risk assessment. This final risk assessment would be submitted after the remedial action construction activities are complete

2.12 Health and Safety Requirements

A conceptual comprehensive site radiological environmental monitoring program will be described and costs will be estimated for each of the "complete rad removal" alternatives developed as part of the SFS. The program would focus on three objectives:

1. Monitor doses at the fence line to determine that the public is protected from releases, if any, during construction and operation of the remedy; and

2. Assure that other on-site workers are not exposed to any increased levels of radiation; and

3. Insure that on-site remediation workers are not exposed to unnecessary radiation exposure

Radiological conditions in adjacent, publicly accessible areas would be monitored by establishing a series of perimeter monitoring locations along the fence line. The conceptual monitoring program would include programmatic details of these monitoring stations such as selection of monitoring locations, the equipment to be housed in each station, and the sampling and reporting frequencies. For example, it is anticipated that perimeter air sampling stations for airborne radioactive particulates and radon would be located at down-wind locations along the fence line. These stations may also house environmental radiation dosimeters. Other potentially harmful particulates may be included in the sampling program.

Worker safety would be a priority during implementation and maintenance/monitoring of the selected remedy for OU-1. Most of the requirements below would apply to work associated with the "complete rad removal" alternatives, i.e., excavating the radiologically-impacted material, loading it into transport vehicles, and placing it in an on-site engineered disposal cell. Differences in potential exposures and risks to workers associated with the various alternatives will be identified and considered in the NCP evaluation of the alternatives (see additional discussion in Section 3). For example, it is anticipated that less material handling and placement and consequently less short-term exposure to site workers would be associated with an off-site disposal option compared to an on-site disposal option. Similarly, it is anticipated that a lesser level of exposure would occur and therefore lower level of personal protective equipment would be required for the landfill regrading option included in the ROD-selected remedy compared to that required for either of the waste excavation and disposal alternatives.

As indicated previously, there is a potential that liquid wastes, RCRA hazardous wastes and/or ACM may be encountered during excavation of solid waste materials contained in Areas 1 and 2. Procedures for identifying the presence of such wastes such as provisions for pre-excavation testing and evaluation, ongoing visual inspection of the wastes that are encountered, and real-time monitoring will be identified and discussed as part of the health and safety requirements. As part of the evaluation of the health and safety requirements for the waste excavation and handling activities, additional requirements that may be necessary in the event that these types of waste materials are encountered will be identified. Impacts to the anticipated waste excavation, handling and disposal procedures, changes to the overall project schedule and additional costs that may be incurred to address worker health and safety and regulatory requirements in the event that such mixed wastes are encountered will be identified and considered as part of the NCP evaluation (see Section 3 below) of the various alternatives.

2.12.1 **Worker Training and Monitoring**

All workers would be trained for work in a radiological work site. Training would be conducted by qualified trainers. Workers would need to be able to ascertain their training qualification before being allowed to work in a radiological-controlled area. Workers would be qualified to wear respiratory protection.

All site workers would be required to participate in a dosimetry monitoring program. As part of the SFS, the scope and costs for personnel dosimetry monitoring will be estimated including per person monthly operations requirements costs as well as costs to set up a dosimetry monitoring program. Some workers in close-by locations could potentially be affected by the on-site activities. This will be evaluated in the SFS and, if necessary, these workers would be integrated into the dosimetry monitoring program. Some training may be required for those personnel. The training may include discussion of the overall activity and the protective actions put in place for the remediation workers and the potential for any risk to the existing landfill site workers. As a minimum, air sampling stations would be positioned to monitor off site locations and to monitor potential airborne emission in the areas where local workers frequent.

Air sampling stations would be established in the work site to monitor airborne particulates, radon, and chemical toxins. Breathing zone samplers would be assigned to selected workers to evaluate potential intake of the same parameters monitored via the air sampling stations.

All site workers would be required to participate in a medical monitoring program. Estimated scope and costs for establishment and maintenance of a medical monitoring program will also be developed as part of the SFS. Medical monitoring would be expected to include the following:

- Respiratory qualification physical;
- Baseline bioassay screening; and
- Potential monthly fecal analysis for thorium. (Note that while fecal analysis is not the norm for bioassay, it is an appropriate method for evaluation of potential thorium exposures. An undiscovered intake would lead to a potential radiation overexposure. The decision to implement fecal analysis would be based on the overall individual protective equipment policy that would be established during implementation of any remedial action.)

Area and personnel air sampling programs would be established that would be capable of detecting both radiological and toxic chemical hazards. Frequent real time survey for radiological hazards and toxic compounds would be conducted. As a minimum, all individuals would be surveyed as they leave a radiological-controlled area.

2.12.2 Personal Protective Equipment and Decontamination

Personnel in an area where loose contamination is known or suspected to exist would wear anti-contamination clothing (Tyvek® disposable outer garments or equivalent). This would consist of protective outer garments, head cover, shoe covers and gloves. Based on results of air sampling performed in the breathing zone of the various work areas (i.e., excavation area, stockpile and materials handling areas, waste segregation equipment, etc.), it may be necessary to use respiratory protection.

The goal of any decontamination effort would be to have no detectable contamination on personnel or equipment that leaves the radiologically-controlled area. A decontamination station would be established at the radiation controlled exit point. Personnel would be surveyed when leaving a radiologically-controlled area after they discard their anti-contamination clothing. Unless site monitoring indicates the presence of chemical wastes or ACM, it would be reasonable to assume that if personnel are not contaminated by radiological contaminants, they are not contaminated by toxic chemicals. If contamination is found, the individual would be decontaminated before being allowed to proceed. Any such incidents would be investigated to limit other such occurrences.

Any equipment leaving the radiologically-controlled area would be cleaned and surveyed. Hand tools and other smaller items of equipment may be brought through the personal exit point after they are cleaned. The decision to have a large equipment decontamination station would be dependent on the conditions at the site. It may be easier to establish such a station on an as-needed basis. All equipment and vehicles that enter the site that have a potential to traverse an area that may contain loose contamination (a controlled area) would be surveyed and decontaminated before leaving the controlled area.

2.12.3 Health and Safety Staffing and Equipment Requirements

A team of professional health and safety personnel would be required while work progresses at the site. These personnel would include, but would not be limited to, industrial hygienists, safety personnel, and health physicists.

A qualified radiation safety professional, such as a Certified Health Physicist, would be required to lead the radiation safety team. Radiation control technicians would be required in sufficient number to perform the required tasks of monitoring, survey, and sample collection. If an on-site laboratory would be used, at least one qualified laboratory technician would be required. Unless the radiation safety specialist is qualified in industrial hygiene and industrial safety (not very likely) qualified personnel in these areas would also be required. Construction safety personnel and possibly industrial hygiene personnel (unless others are cross-trained to performed industrial hygiene monitoring) may also be required in addition to health physicist personnel. The total personnel estimated to be required to implement, monitor and manage health and safety requirements will be estimated during preparation of the SFS.

Radiation survey and laboratory equipment requirements that would be necessary to support the "complete rad removal" alternatives will also be developed in the SFS. Equipment requirements would be dependent on the number of personnel required during implementation of the remedial action. Until the number and type of personnel are identified for each alternative evaluated during the SFS, the following tentative equipment list cannot be finalized but provides a general listing of the radiation survey and other sampling equipment that could be included:

- Rad Survey Instruments:
  - __6 α/β survey instruments;
  - __2 dose rate instruments (MicroR);
  - __4 scintillation survey instruments;
  - __3 pancake Geiger Mueller (GM) survey instrument;
  - __1 or more GM survey instrumentd;
  - __Radon detection monitor(s);
  - __Radon daughter detectors; and
  - __Radiation Survey Equipment for Final Survey (rent as needed).

- Toxic Gas Monitors (e.g., ammonia, carbon monoxide, chlorine gas, hydrogen sulfide, sulphur dioxide, methane, and lower explosive limit)
- Organic vapor analyzers (photoionization detectors and/or flame ionization detectors)

- Air Sampling Equipment:
  - Air Pumps and filter holders for fixed position samplers in the work site(s);
  - Air Pumps and filter holders for fixed position samplers for perimeter monitoring with enclosures as needed.;
  - Breathing zone air samplers; and
  - Air sample calibrator(s).

- Soil sampling equipment:

The estimated requirements and costs for establishing an on-site laboratory that would provide real-time results for use in controlling excavation and providing feedback on radiological conditions at the site will also be developed in the SFS and may include the following:

Laboratory set-up:

- Building or office type trailer with power and air-conditioning
- Multi-channel analyzer (MCA) with analytical software
- Low background alpha/beta counter
- Source Standard for MCA
- Standard source for the low background counter
- Drying oven
- Scales
- Computer and printer

2.12.4 Respirator, PPE and Consumable Requirements

The nature and anticipated cost of the respiratory protection equipment, personal protective equipment (PPE) and consumable items that would be necessary to support a health and safety monitoring program will be developed as part of the SFS. It is anticipated that each person working in a radiologically-controlled area would require a respirator and that all personnel would use Tyvek suits and/or other anti-contamination clothing that would be changed-out and discarded several times daily. Each person would be required to have waterproof steel-toed safety boots and a hard hat. Each person would also be provided with safety glasses and work gloves that would likely need to be replaced at some frequency due to loss, breakage, or wear.

Several hundred sample containers would be needed for collection and analysis of health and safety related samples. Smears, placards and other warning signs and yellow radioactive waste bags would also be required. Materials estimated to be necessary for personnel decontamination such as wash basins, brushes, soaps, and paper towels, among other items will be identified in the SFS and the costs for such materials will be estimated based on the anticipated project duration. Similarly, miscellaneous office supplies that would be necessary to support operation of the on-site laboratory will also be estimated in the SFS along with additional and spare equipment and supplies necessary to operate and maintain the analytical laboratory and field monitoring equipment.

2.12.5 Reduction of Worker Efficiency

For purposes of preparing cost estimates for the SFS, it is anticipated that dressing and undressing from the personnel protective equipment and performing personnel decontamination for breaks and at the end of each shift would require approximately one hour per day. Wearing of anti-contamination clothing would necessitate longer rest periods during periods of hot weather. Longer rest periods may account for an extra one/half to one hour according to the magnitude of the temperature. If respiratory protection would be required, additional rest periods would be required if the weather is hot. The protective equipment would likely reduce productive time by at least one hour on cool days and two hours on hot days.

2.13 Institutional Controls/Site Re-use Evaluation

Evaluation in the SFS of the "complete rad removal" alternatives will include identification of additional institutional controls that may be necessary to insure the protectiveness and long-term effectiveness of the alternatives. For example, construction of an on-site engineered disposal cell may require implementation of additional institutional controls or modification and/or expansion of some or all of the existing institutional controls or the institutional controls currently anticipated to be implemented as part of the remedy selected in the ROD for OU-1. Evaluation of the "complete rad removal" alternatives will also include identification of institutional controls, if any, that are currently anticipated for Areas 1 and 2 but that may not be necessary if "complete rad removal" were to be implemented.

Evaluation of the "complete rad removal" alternatives will also include identification of potential site re-use alternatives that may be allowable if a "complete rad removal" alternative were implemented for Areas 1 and 2. Specifically, site owner Rock Road Industries, Inc. will provide information on land uses that it considers acceptable and that are typically implemented at closed landfill sites. EPA guidance on re-use of landfill sites will also be consulted (EPA, 2002b and EPA, 2001). Additional land uses that may be appropriate for Areas 1 and 2, assuming that "complete rad removal" were implemented, and that would not otherwise interfere with the protectiveness and effectiveness of the various components of the "complete rad removal" alternatives, will be identified. To the extent that any additional allowable land uses are identified, the potential value, if any, of such site re-use options will be identified. If additional site re-use options are identified and if such options may allow for site income that would not otherwise be achieved if the remedy selected in the ROD for OU-1 were implemented, the value of such options will be identified as potential positive income and considered as a potential offset to the costs of implementation of the "complete rad removal" alternatives.

2.14 Construction Project Schedules

Project schedules including critical path schedules will be prepared for the construction phase activities and included in the SFS. Project schedules will be prepared for both the excavation and off-site commercial disposal alternative and the excavation and on-site disposal in an engineered disposal cell alternative. The SFS will also include a critical path schedule for the ROD-selected remedy for comparative purposes. These schedules will reflect both optimal construction schedules as well as budget-constrained schedules (as described further in Section 2.14). The critical path schedules will display the various tasks and subtasks that would be necessary to design, construct, operate and maintain the various components of the alternatives. Along with the expected durations necessary to complete each of these tasks and subtasks, these schedules will also display the relationships among the various tasks and subtasks that together act to constrain the overall project schedules. The schedules and critical path diagrams will be prepared using Microsoft Project or equivalent software. The project schedules will be summarized in narrative text of the SFS report and the project schedule diagrams will be included in an appendix to the SFS report.

2.15 Estimation of Probable Costs

Estimates of probable costs will be developed for each of the two "complete rad removal" alternatives. The cost estimates previously prepared for the remedy selected in the ROD for OU-1 will also be updated to 2010 costs using the Engineering News Record Construction Cost Index (ENR CCI). In accordance with the NCP as well as the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988) and A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA, 2000b), estimated capital costs, annual operation and maintenance (O&M) costs, periodic costs, and present worth costs will be prepared.

Capital costs will include (1) direct costs for labor, equipment, materials, subcontractors, contractor markups such as overhead and profit, and professional/technical services that are necessary to support construction of the remedial action, and (2) indirect capital costs that are not part of the actual construction but are necessary to implement the remedial action (e.g., engineering, legal, construction management, and other technical and professional services). O&M costs will include annual post-construction costs for labor, equipment, materials, subcontractors, and contractor markups such as overhead and profit associated with activities such as monitoring and maintaining the components of the remedial action. Annual O&M costs will also include expenditures for professional/technical services necessary to support O&M activities. Periodic costs are those that occur only once every few years (e.g., five-year reviews and equipment replacement) or expenditures that would occur only once during the entire O&M period or remedial timeframe (e.g., well abandonment, update of ICs Plan, and site closeout). In accordance with the above-referenced guidance documents, costs estimates are expected to be prepared to provide an accuracy of +50 to -30 percent.

In preparing the cost estimates used in this SFS, quantities for labor, equipment, and materials will be developed as discussed in Sections 2.1 through 2.13 above. Cost data will be selected from a variety of sources including cost estimating guides and references such as unit prices in the latest RS Means Heavy Construction and Sitework & Landscaping Cost Data, RS Means CostWorks 2010 digital cost data, site-specific vendor and contractor quotes, experience with actual costs from similar projects, other historical project costs updated to 2010 costs using the ENR CCI, and engineering judgment.

Estimates for professional/technical services cost elements (project management, remedial design, construction management, and technical support) will be based on the example percentages in Exhibit 5-8 of A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA, 2000b) for construction of remedies greater than $10 million. These percentages of total construction cost are 5, 6, and 6 percent, respectively for project management, remedial design, and construction management. These percentages may be adjusted up or down based on engineering judgment.

An estimating contingency will be added as a percentage of the total capital, annual O&M, and periodic costs to cover unknowns, unforeseen circumstances, or unanticipated conditions that are not possible to evaluate from the data on hand at the time the estimates are prepared. The contingency will be comprised of two elements: scope and bid. Scope contingency covers unknown costs due to scope changes that may occur during detailed remedial design, since design concepts are not typically developed enough during preparation of the FS to identify all project components or quantities. Bid contingency represents costs, unforeseeable at the time of estimate preparation, which are likely to become known as the remedial action construction or O&M proceeds. Bid contingency accounts for changes that occur after a construction or O&M contract is awarded and represents a reserve for quantity overruns, modifications, change orders, and/or claims during construction or O&M. Examples include changes due to adverse weather, material or supply shortages, or new regulations.

A present worth analysis will also be prepared to allow the series of future and near-term estimated costs of each alternative to be compared on the basis of a single figure. While the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988) recommends the general use of a 30-year period of analysis for estimating present worth costs during the FS, the more recent A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA, 2000b) recommends that for projects with durations exceeding 30-years, both a present worth analysis using the project duration and a non-discounted constant dollar cash flow over time scenario be prepared. Both the present worth and non-discounted constant dollar cash flow analyses will be presented for each alternative. It should be noted that the 2000 guidance states "Non-discounted constant dollar costs are presented for comparison purposes only and should not be used in place of present value costs in the Superfund remedy selection process." USEPA policy on the use of discount rates for RI/FS present worth cost analyses is stated in the preamble to the NCP (55 FR 8722) and in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-20 entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (EPA, 1993). The latest (December 2, 2008) OMB Circular A-94 Appendix C 30-year Real Discount Rate for 2009 is 2.7 percent. This rate will be used for the present worth analysis.

In addition to the present worth evaluations, cash flow analyses for each of the two "complete rad removal" alternatives as well as the remedy selected in the ROD for OU-1 will be prepared assuming optimal construction schedules to minimize remedy construction costs and including St. Louis area construction season considerations. A second set of cash flow analyses (and associated construction schedules) will also be provided assuming capital expenditures of only $10 million per year. Under the scenarios subject to a $10 million per year expenditure limitation, the duration of construction and total capital costs will be higher than those where the construction schedules and associated construction costs are optimized.

3 NCP Evaluations

USEPA's correspondence of January 11, 2010 directing the Respondents to prepare a SFS specifies that the two "complete rad removal" alternatives be analyzed using the threshold and primary balancing criteria provided in the NCP at 40 CFR § 300.430. A comparative analysis of the "complete rad removal" alternatives against the remedy selected in the ROD for OU-1 is also to be conducted.

3.1 Detailed Evaluation of "Complete Rad Removal" Alternatives

In accordance with the NCP, the relative performance of each alternative is evaluated in the FS using the nine evaluation criteria [Section 300.430 (e)(9)(iii)] in the NCP as a basis for comparison. The purpose of the detailed evaluation process is to determine which alternative: (a) meets the threshold criteria of overall protection of human health and the environment and attainment of ARARs, (b) provides the "best balance" with respect to the five balancing criteria of 40 CFR § 300.430(e)(9)(iii)(C)-(G), and (c) takes into consideration the acceptance of the support regulatory agency and the community. USEPA's correspondence of January 11, 2010 specifies that only the two threshold criteria and five primary balancing criteria are to be used in the detailed analysis of the two "complete rad removal" alternatives in the SFS. Specific strengths and weaknesses relative to these statutory requirements and technical criteria will be highlighted during the detailed analysis.

Threshold criteria are requirements that each alternative must meet to be eligible for selection as the preferred alternative, and include overall protection of human health and the environment and compliance with ARARs (unless a waiver is obtained). Primary balancing criteria are used to weigh effectiveness and cost tradeoffs among alternatives <u>that meet the threshold criteria</u>. The primary balancing criteria include long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The primary balancing criteria represent the main technical criteria upon which the alternative evaluation is based. The criteria are described in more detail as follows:

Threshold Criteria:

- Overall Protection of Human Health and the Environment addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering, or institutional controls.

- Compliance with ARARs addresses whether a remedy meets ARARs set forth in federal and state environmental laws and/or justifies a waiver from such requirements.

Primary Balancing Criteria:

- Long-term Effectiveness and Permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- Reduction of Toxicity, Mobility, or Volume through Treatment addresses the statutory preference for selection of a remedial action that employs treatment technologies that permanently and significantly reduce toxicity, mobility, or volume through treatment of the hazardous substance as a principal element.

- Short-term Effectiveness considers the time to reach cleanup objectives and the risks an alternative may pose to site workers, the community, and the environment during remedy implementation. This criterion also considers the reliability and effectiveness of any mitigative measures taken during remedy implementation to control those short -term risks.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular alternative.

- The "Costs" criterion includes estimated direct and indirect capital costs associated with construction of a remedy as well as estimated post-construction annual operation, maintenance, and monitoring costs and periodic costs. Cost estimating that will be conducted for the SFS was previously discussed in Section 2.15.

The SFS will also include an evaluation of potential occurrences of principal threat wastes in accordance with EPA's "A Guide to Principal Threat and Low-Level Threat Wastes (EPA, 1991). This evaluation will be included as part of the evaluation of the long-term effectiveness and permanence and/or the reduction in toxicity, mobility or volume through treatment of each alternative. This evaluation will reflect the results of the engineering evaluations performed as part of the SFS.

The NCP also requires remedial alternatives to be evaluated in terms of Modifying Criteria which include State and community acceptance. State acceptance will be evaluated by EPA based in part on comments provided by MDNR on the SFS. State and community acceptance will be evaluated by EPA as part of any decision process that may be undertaken by EPA after completion of the SFS.

3.2 Comparative Analysis of "Complete Rad Removal" Alternatives

The relative performance of each of the two "complete rad removal" alternatives and the remedy selected in the ROD for OU-1 will be evaluated against the performance of the other alternatives for each of the threshold and primary balancing criteria during the comparative analysis. This comparative analysis will identify the advantages and disadvantages of each alternative.

Prior to conducting the comparative analysis, components of remedy selected in the ROD may require updating. In particular, unit costs for labor, equipment, materials, and monitoring included in the cost estimates for the remedy selected in the ROD will need to be updated to the current unit costs that will be used in the cost estimates for the two "complete rad removal" alternatives.

The volume of disturbed material (inclusive of both waste materials containing radionuclides above the cleanup levels, and the non-impacted materials) generated under both of these two alternatives will also be compared to those volumes associated with the grading design incorporated in the Remedial Design Work Plan (RDWP) dated November, 25, 2008. The RDWP was prepared pursuant to the May, 1, 2008 ROD for the project. This will allow for a thorough comparative analysis of all of the alternatives under consideration.

4 Report Preparation

Upon completion of the engineering and NCP evaluations, a draft SFS Report will be prepared. A potential outline for the SFS Report is as follows:

1. Introduction, Purpose, and Scope of SFS
2. Engineering Evaluations (as described in Section 2 of this Work Plan)
3. Development of Alternatives
4. Detailed Analysis of Alternatives
5. Comparative Analysis of Alternatives
6. References

Appendices

A. Applicable or relevant and appropriate requirements
B. Identification of radiologically-impacted material
C. Extent and volume of radiologically-impacted material
D. Excavation plan
E. Offsite disposal facility requirements
F. On-site disposal cell conceptual design
G. Conceptual grading plans for excavation and regrading alternatives
H. Waste segregation evaluation
I. Sampling and Analysis Plan outline
J. Health and Safety Plan outline
K. Institutional controls/site reuse evaluations
L. Preliminary construction schedules
M. Estimated costs for remedial alternatives

Activities necessary for completion of the draft SFS Report include the following:

- Prepare draft report;
- Internal project team review of draft report;
- Prepare revised draft report; and
- Submit Draft SFS Report to EPA.

Upon completion of EPA review of the Draft SFS Report, it is assumed that EPA will provide written or verbal comments on the Draft SFS Report. A meeting to discuss EPA's comments is also anticipated. Responses to EPA's comments may be prepared and a Final SFS Report will be prepared subsequent to this meeting. The activities necessary for preparation of the Final SFS Report are anticipated to be similar to those listed above for preparation of the Draft SFS Report.

The status of the work performed to complete the SFS will be tracked and reported to EPA in monthly status reports, as required by the Administrative Order on Consent (EPA, 1993, as amended).

5 Schedule to Complete Supplemental FS

A critical path schedule for the various activities to be conducted to complete the SFS is presented on Figure 4. This schedule meets the requirement set forth in the Statement of Work that the SFS Report be submitted within 60 days of EPA approval of the Work Plan. In order to meet this requirement, the duration of many of the task activities have been reduced to the minimum amount necessary to complete the activity. In addition, work on the SFS will be initiated prior to EPA approval of the Work Plan.

As shown on Figure 4, it is anticipated that a meeting will be held among EPA representatives, MDNR representatives, and the EMSI project team early-on in the SFS preparation process for purposes of reaching an agreement with respect to the identification, configuration, and extent/distribution (location, depth interval[s], and three-dimensional configuration) of radiologically-impacted materials prior to developing the "complete rad removal" alternatives and conducting the SFS evaluations. A subsequent meeting(s) may also be held among EPA, MDNR, and EMSI to reach agreement on volume estimates for radiologically-impacted materials, discuss the waste segregation and cleanup level evaluations, and review the first draft of the engineering evaluations sections of the SFS Report.

6 Project Team/Organization

The Project Team that will prepare the SFS is composed of three engineering and environmental firms consisting of:

- Engineering Management Support, Inc. (EMSI)
- Feezor Engineering, Inc. (Feezor)
- Auxier & Associates, Inc. (Auxier)

EMSI will serve as the Supervising Contractor and will provide overall project management and technical direction to the project. Mr. Paul V. Rosasco, P.E., of EMSI will serve as the Project Coordinator. Having previously been responsible for the RI and FS for OU-1, EMSI personnel are familiar with the various aspects of the project. EMSI is currently in the process of preparing the remedial design (RD) for the remedy selected in the ROD for OU-1. EMSI will be responsible for the following activities for the SFS:

- Identification of the various technical requirements of the project, assignment of project tasks to the various members of the project team, development and tracking of the project schedule and budget, and review and approval of project deliverables and overall Quality Assurance;
- Identifying soil volumes to be considered for removal or relocation;
- Developing pre-excavation waste characterization/surveying/sampling needs;
- Soil/waste segregation evaluation;
- Evaluation of off-site commercial disposal alternatives;
- Institutional Controls/Site reuse evaluations;
- Preparing schedules for alternatives implementation;
- Preparing cost estimates for alternatives;
- Conducting NCP criteria evaluations of alternatives; and
- Preparation of monthly project status reports to EPA and for scheduling and coordination of meetings and interactions with EPA and MDNR.

Feezor Engineering, Inc. specializes in solid waste and landfill facility-related planning, design, and construction projects and will conduct the activities associated landfill cell and cover conceptual design and earthwork quantity determinations for the alternatives considered for the SFS. Feezor will also be responsible for preparing drawings and illustrations using AutoCAD software. Feezor has extensive experience designing and permitting solid waste landfill cells and covers with components similar to those required for the alternatives to be evaluated in the SFS. Feezor is currently serving with EMSI in preparing the RD for the landfill design component of the remedy selected in the OU-1 ROD and has previously worked at the Bridgeton Landfill on closure of the former leachate lagoon. For the SFS, Feezor will conduct the following activities:

- Calculation of volumes to be excavated and disposed or relocated;
- Preparation of excavation plans;
- Conceptual design of the on-site engineered disposal cell alternative;
- Conceptual design of the closure of the remaining OU-1 solid waste areas;
- Assisting EMSI in preparing schedules for alternatives implementation; and
- Preparing cost estimates for alternatives.

Auxier & Associates, Inc. specializes in health physics and radiation safety and is familiar with the OU-1 project site, having prepared the Baseline Risk Assessment (Auxier, 2000) associated with the RI/FS for OU-1. Auxier will be responsible for the following SFS activities:

- Preparing an excavation verification sampling plan;
- Conducting assessments of potential risks to workers and the community associated with the various activities for each alternative;
- Determining the health and safety requirements for the alternatives including monitoring, decontamination, and effects on production; and
- Developing cost estimates for health and safety and monitoring.

Figure 5 presents an organization chart for the project team that will prepare the SFS. Specific personnel to be involved and the generalized lines of communication and responsibility are indicated on Figure 5. Resumes for the various project team members are provided in Appendix A.

7 References

AutoCAD Civil 3D (Version 2010) [Computer software], San Rafael, CA: Autodesk.

Auxier & Associates, Inc., 2000, Baseline Risk Assessment (Appendix A to Remedial Investigation Report), West Lake Landfill Operable Unit 1, April 24.

Dan Wall, 2010, personal communication, January 14.

Engineering Management Support, Inc. (EMSI), 2006, Feasibility Study Report, West Lake Landfill Operable Unit 1, May 8.

EMSI, 2000, Remedial Investigation Report, West Lake Landfill Operable Unit 1, April 10.

United States Environmental Protection Agency (EPA), 2010d, Letter from Dan Wall EPA Region 7 to Paul Rosasco, EMSI, re: Draft Work Plan for Supplemental Feasibility Study Radiological-Impacted Material Excavation Alternative Analysis, for West Lake Landfill Operable Unit 1, January 28, 2010, March 8.

EPA, 2010c, Electronic mail dated February 19, 2010 from Daniel Gravatt, EPA Region 7 to Paul Rosasco, EMSI, re: EPA comments on draft Supplemental FS Workplan for Westlake Landfill, with attached letter from Daniel Wall EPA Region 7 to Paul Rosasco, EMSI re: Draft Work Plan for Supplemental Feasibility Study, Radiological-Impacted Material Excavation Alternatives Analysis, for West Lake Landfill Operable Unit-1, January 28, 2010

EPA, 2010a, Letter from Cecilia Tapia, Region 7 Director Superfund Division to Michael Hockley (Spencer Fane Britt & Browne, LLP), Charlotte Neitzel (Holme, Roberts & Owen, LLP), and Christina Richmond (U.S. Department of Justice) Re: West Landfill Site, Bridgeton, Missouri Administrative Order on Consent, Docket No.: 93-F-0005, January 11.

EPA, 2010b, Statement of Work for Supplemental Feasibility Study, West Lake Landfill Site (attachment to EPA's January 11, 2010 letter).

EPA, 2009a, National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 CFR § 300.440.

EPA, 2009b, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Inhalation Risk Assessment), Final, EPA-540-R-070-002, January.

EPA, 2008, Second Amendment to Administrative Settlement Agreement and Administrative Order on Consent, Docket No. VII-93-F-0005, filed March 3.

EPA, 2008, Record of Decision – West Lake Landfill Site, Bridgeton, Missouri, Operable Unit 1, May.

EPA, 2006, Proposed Plan – West Lake Landfill Site Operable Units 1 and 2, Bridgeton, Missouri, June.

EPA, 2005, EPA Superfund Record of Decision: St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Co., EPA ID: MOD980633176 OU 1, St. Louis, MO, EPA/ROD/R07-05/045, September 2.

EPA, 2004, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final, EPA/540/R-99/005, July.

EPA, 2002a, Simulating Radionuclide Fate and Transport in the Unsaturated Zone: Evaluation and Sensitivity Analyses of Select Computer Models, EPA/600/R-02/082, July.

EPA, 2002b, Reusing Superfund Sites: Commercial Use Where Waste is Left on Site, EPA 540-K-01-008, OSWER 9230.0-100, February.

EPA, 2001a, Reusing Superfund Sites: Recreational Use of Land above Hazardous Waste Containment Areas, EPA 540-K-01-002, OSWER 9230.0-93, March.

EPA, 2001b, Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments), Final, Publication 9285.7-47, December.

EPA, 2000a, Soil Screening Guidance for Radionuclides: Technical Background Document, EPA/540-R-00-006, October.

EPA, 2000b, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July.

EPA, 1999a (and current updates), Cancer Risk Coefficients for Environmental Exposure to Radionuclides, Federal Guidance Report No. 13, EPA 402-R-99-001, September.

EPA, 1999b, Radiation Risk Assessment at CERCLA Sites: Q & A, EPA/540/R/99/006, December.

EPA, 1998a, Memorandum: Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, OSWER Directive no. 9200.4-25, February 12.

EPA, 1998b, Superfund Record of Decision, St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Co., EPA ID: MOD980633176 OU 2, St. Louis, MO, EPA/ROD/R07-98/169, August 27.

EPA, 1997, Memorandum: Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination, OSWER Directive no. 9200.4-18, August 22.

EPA, 1997, First Amendment to Administrative Order on Consent, Docket No. VII-93-F-0005, July 16.

EPA, 1993a, Administrative Order on Consent for Remedial Investigation/Feasibility Study, Docket No. VII-93-F-0005, filed March 3.

EPA, 1993, Presumptive Remedy for CERCLA Municipal Landfill Sites, Office of Solid Waste and Emergency Response Directive 9355.0-49FS, EPA 540-F-93-035, September.

EPA, 1991a, Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites, EPA/540/P-91/001, February.

EPA, 1991b, A Guide to Principal Threat and Low Level Threat Wastes, Office of Emergency and Remedial Response, Superfund Publication 9380.3-06FS, November.

EPA, 1991c, Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim, EPA/540/R-92/003, December.

EPA, 1991d, Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), Interim, Publication 9285.7-01C, October.

EPA, 1989, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December.

EPA, 1988a, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA/540/6-08/004, OSWER Directive 9355.3-01, October.

Herst & Associates, Inc., 2006, Feasibility Study Report – West Lake Landfill Operable Unit 2, Bridgeton, Missouri, June.

Herst & Associates, Inc., 2000, Remedial Investigation Report – West Lake Landfill Operable Unit 2, Bridgeton, Missouri, June.

Missouri Department of Natural Resources (MDNR), 2010, Electronic mail dated February 18, 2010 from Shawn Muenks, MDNR to Paul Rosasco, EMSI re: WLL OU-1 SFS WP – MDNR comments with attachment titled Missouri Department of Natural Resources Comments on the West Lake Landfill Operable Unit 1 Work Plan for Supplemental Feasibility Study.

MDNR, 1998, Solid Waste Regulations, 10 CSR 80-3.010, July 31.

Nuclear Regulatory Commission, 1988, Radioactive Material in the West Lake Landfill – Summary Report, NUREG 1308 – Rev. 1, Jume

Radiation Management Corporation (RMC), 1982, Radiological Survey of the West Lake Landfill, St. Louis County, Missouri.

TetraTech EM, Inc., 2009, Cost Evaluation for Excavation Remedial Alternative, Revision 01, West Lake Landfill Site, Bridgeton, Missouri, Operable Unit 1, START 3 Contract No, EP-S7-06-01, Task Order No. 0142, September 3.

Table

Figures

Appendix A:

Resumes of Project Team Members

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Paul Rosasco, PE
Engineering Management Support, Inc.
7720 West Jefferson Avenue, Suite 406
Lakewood, Colorado 80235

Dear Mr. Rosasco,

RE: Revision 1 Work Plan for Supplemental Feasibility Study, Radiological-Impacted Material Excavation Alternatives Analysis, for West Lake Landfill Operable Unit-1, March 29, 2010

The United States Environmental Protection Agency (EPA) has reviewed the subject document, received via electronic mail on March 29, 2010, and finds it to be generally acceptable. EPA hereby approves the document with the following comments, which are intended to provide additional clarity.

1. Section 1.2: In the second sentence, delete the phrase beginning with "including" and ending with "(EPA, 1991a)" so that the sentence reads "Based on the results of the OU-1 RI, six potential remedy alternatives...".

2. Section 1.3: Add the following sentence at the end of the section, after the sentence ending in "...are specified in the ROD": "Additional performance standards were identified and will be incorporated into the remedial design as a result of subsequent discussions between EPA Region 7 and EPA's Office of Superfund Remediation and Technology Innovation."

3. Section 1.4, second bullet: Add the phrase "... if a suitable location outside the geomorphic floodplain can be identified" after "... on-site engineered disposal cell with a liner and cap."

4. Section 2.1.2, third paragraph: Add the following sentences at the end of the paragraph, after the sentence ending in "... no longer be required": "EPA policies pursuant to CERCLA and the NCP do not require removal of all radionuclides. The radionuclide levels that would remain with Radiological Areas 1 and 2 under the "complete rad removal" alternative would be protective of human health for reasonably expected future exposure scenarios."

MOKS MOKS
GRAVATT BUCHHOLZ

5. Section 2.1.2, fourth paragraph: Add the phrase "...using standard Risk Assessment Guidance for Superfund (RAGS) methodology and site-specific exposure factors..." after "...would be 2.6 pCi/g".

6. Section 2.4.3: Add the phrase "...and found to be at or below cleanup levels" after "... results for Th-230 are reported".

7. Section 2.7, second paragraph: In the first sentence, replace "cursory" with "preliminary".

8. Section 2.7, sixth paragraph: In the third sentence, remove the word "mixed" after "... these types of...".

9. Section 2.8: Add "... if a suitable location outside the geomorphic floodplain can be identified" to the end of the first sentence.

10. Section 2.11, third paragraph: EPA does not object to the use of the RESRAD-Offsite model for evaluating radiological risks in all applicable exposure media. However, EPA requires that a parallel set of risk calculations for air be conducted using the Building PRG (BPRG) methodology, to provide a check on the RESRAD-Offsite results. EPA also requires that a parallel set of groundwater flow models and fate and transport calculations be conducted using an appropriate stand-alone groundwater model such as HYDRUS or MODFLOW, to provide a check on the RESRAD-Offsite results.

11. Section 2.12, fourth paragraph: In the first sentence, delete the duplicated word "that".

12. Section 3.1, second paragraph: Add the phrase "... that meet the threshold criteria" after "...tradeoffs among alternatives...".

13. Section 4, bullet A: This bullet should read "Applicable **or** relevant and appropriate requirements".

Please provide a hard copy of the document which implements these changes to the text and a revised title page to indicate the document is the Final work plan. If you have any questions, you may contact me at 913-551-7324.

Sincerely,

Daniel R. Gravatt
Remedial Project Manager
Missouri-Kansas Branch
Superfund Division

cc: Shawn Muenks, MDNR
Rich Kapuscinski, EPA HQ (e-mail only)
Charlotte Neitzel, Holme Roberts & Owen (e-mail only)
Christina Richmond, US DOJ for US DOE (e-mail only)
Mike Hockley, Spencer Fane Britt & Browne
Kate Whitby, Spencer Fane Britt & Browne (e-mail only)
Bill Beck, Lathrop & Gage (e-mail only)

bcc: Cheryle Micinski, CNSL